ASHRAE
OFFICIAL PUBLICATION

JOURNAL

Heating • Refrigerating • Air Conditioning • Ventilating

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS

Exciting progress continues to occur and be reported upon in the field of thermoelectric materials and equipment. Three papers at the recent ASHRAE Annual Meeting in Vancouver related to this and in this issue (page 42) W. V. Huck discusses thermoelectric devices used in heat pumping. Here are members of ASHRAE's Technical Committee 1.4 Thermoelectricity planning ahead. In the usual order, J. D. Meess, G. D. Hudelson, W. V. Huck, H. Kasch, E. R. Wolfert (Chairman), Peter Taylor, A. F. Phillips, R. L. Eichhorn and L. A. Staebler.

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Comment

THE SHAPE OF THINGS TO COME

No doubt there may be excellent reasons why consumer products, be they automobiles, refrigerators, air conditioners or what you will, should acquire the proportions, outlines, surfaces and decorative motifs which they do. Yet, it is quite possible that alternate patterns might be quite as acceptable or even, for the sake of argument, more effective. The fact is that, once started, trends tend to project themselves and to proceed through successive steps to present status.

We think of this partly because there are little, recurrent bursts of self-examination on the part of engineer-designers which sometimes lead to alternate action but more frequently leave important decisions in the realm of what can only be called caprice. More specifically, subjective, rather than objective, reasoning dominates quite frequently. More often, the decision rests upon what people can be made to like rather than what consumers actually prefer.

Historically, in the mid-Thirties industrial designers created a place for themselves in the field of consumer products by producing imaginative handling of materials and surfaces and colors in ways which had not been done before. Far be it for us to disparage their contributions for, though these were often made by virtually non-technical minds, they were spectacular as to results and led to improved products which met expanding markets.

The time comes when the pendulum inevitably swings. We think that engineering-design is presently entering that changing phase. Having swung to the point of styling for styling's sake and the production of consumer dissatisfaction in the interest of yearly changing models there seems to be some evidence of return to what was once called functional designing. It was Louis Sullivan who propounded that form follows function and really introduced the whole concept of integrated design. It was John Ruskin who, more gruffly, advised that a railroad station should look like a railroad station.

Without putting on the mantle of a prophet we think we sense some return to the functional rather than the style concept. We wish that some of the more eager proponents of projected styling, art, music and architecture agreed with us.

But, we think time is on our side.

Edward R Searles
Editor

Now that you mention it—

120,000 FRENCH ONES

To the Editor:

In the "They Wanted to Know" page of your November 1959 JOURNAL an inquiry regarding electromagnetic refrigerator compressors was reported.

We manufacture household refrigerators with hermetic electromagnetic compressors and more than 120,000 of these are in service currently. They bear the label of quality of l'Association Francaise de Normalisation (AFNOR) and of the Federation Nationale des Activites Frigorifiques (FNAF). The strictness of these standards is well known.

Contrary to the opinion expressed in the published reply, we find these units to offer few operational disadvantages; they have been in production for several years.

It is true that there are limits to the pressures which can be developed but this is really a great advantage as the compressors do not risk damage under possible abnormal operating conditions. They operate quite well in tropical climates, too.

There is some problem of noise due to the rapid oscillations but this we have resolved to the point where our electromagnetic units do not exceed the noise level (expressed in phones) of the best refrigerators of other types on the French market.

So far as we know, there are no such units manufactured elsewhere, except under our license, other than a recently undertaken Japanese product made within a German patent.

GUY BELLANGER

Societe Anonyme des Usines Chausson Asnieres (Seine) France

NEXT MONTH —

DEATH AND HUMIDITY
P. H. Kutschenreuter explores the zone where weather and mortality interrelate

WHAT'S NEW IN LITHIUM BROMIDE ABSORPTION
P. H. Johnson looks at an important resurgent field

WHEN JALOUSIES ARE USED IN THE HOUSE
Another ASHRAE Laboratory report upon solar heat gains

Late news highlights

Exposition growing Heavy early demands for space at the 15th International Heating and Air Conditioning Exposition promise one of the largest displays of heating, ventilating, air conditioning and refrigerating equipment ever held. This exposition will be concurrent with ASHRAE's Semiannual Meeting in Chicago, February 13-16, 1961.

New division Formed as a division of Carrier Corporation, the Carrier Air Conditioning Company will be responsible for the businesses formerly conducted by the Machinery and Systems and Unitary Equipment divisions of the Corporation.

AIA Register 1960 Building Products Register of the American Institute of Architects presents in tabular form technical data needed for pre-selection of building materials, providing a method of direct comparison of products engineered to perform similar functions. Products are classified according to type by category and subcategory and are identified with applicable standards. Technical reference material for each product type is included in the Abstracts of Standard Documents following product listings in each category. Copies are available from AIA, 1735 New York Avenue, N.W., Washington 6, D. C. Price is $25.

Thermoelectricity on submarines Department of Navy, Bureau of Ships has awarded a research contract to York Division of Borg-Warner Corporation to assist the Navy in developing food refrigeration systems using thermoelectric materials for possible application in future submarines.

Spray foam insulation Utilizing foam-in-place urethane—a synthetic resin foam said to be capable of expanding its own volume by 30 times upon application—a liquid spray foam insulation for home buildings has been developed. Initial tests indicated that it might cut installation time in half over present insulation methods. Urethane foam tested was manufactured by Dayton Industrial Products Co.

Air analyzed *Air Pollution Manual, Part I—Evaluation* provides information for appraising air pollution problems. Nature of pollutants, quantities present in the atmosphere and their effects on health, vegetation and animals are among subjects covered within 194 pages. Published by the American Industrial Hygiene Association, 14125 Prevost, Detroit, Mich.

Plastics trailer Substituting a stressed skin plastics laminate for the metal posts and beams of conventional reefers to cut weight and add extra cargo space for transporting of refrigerated and frozen foods, a non-metal trailer has been developed by Perfection Division, Hupp Corporation.

NSPE meets Some highlights of the four-day, 26th annual meeting of the National Society of Professional Engineers held in Boston in June were: Board approval of the establishment of an Institute for the Certification of Engineering Technicians; steps toward implementation of the Functional Plan for unity of the engineering profession; and a preliminary report on the new survey, "Engineering Professionalism in Industry", made by the Professional Engineers Conference Board for Industry.

Cryogenic data *Mechanical Properties of Structural Materials at Low Temperatures—A Compilation from the Literature* by R. M. McClintock and H. P. Gibbons, National Bureau of Standards Monograph 13, contains tensile strength, yield strength, tensile elongation and impact energy of about 200 materials, metallic and non-metallic, given graphically as functions of temperature between 4 to 300K. Copies of this 180-page publication may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. for $1.50.

Space age living Under the direction of Dr. Charles J. Kensler, the newly established Life Sciences Division of Arthur D. Little, Inc., will investigate uses of biology in industrial processes and in evaluating effects on man and animals of industrial products. Studies will range from investigation of the direct use of microorganisms in fermentation processes to the evaluation of exposure risks encountered in space travel.

Honors program Ford Foundation has awarded $700,000 to the Polytechnic Institute of Brooklyn to establish an honors program in science and engineering whereby exceptional students will be able to receive a doctorate in six years of full-time study.

Imminent conference From August 23-25 the 1960 Cryogenic Engineering Conference, co-sponsored by the University of Colorado and the National Bureau of Standards, will take place in Boulder, Colo.

Visiting Russia Under the auspices of the National Science Foundation and the U. S. State Department, an Engineers Joint Council six-man delegation representing United States engineers is spending a month in the U.S.S.R. studying the utilization and allocation of Soviet engineers and technicians.

TTMA meeting Two general sessions and a technical engineering session were features of the 12th Annual Summer Meeting of the Truck Trailer Manufacturers Association, July 10-13 in Hot Springs, Va. Pertinent, up-to-the-minute topics were covered at the different sessions.

Survey report As part of its survey of the heating industry, the Building Materials Division of the Business and Defense Services Administration, U. S. Department of Commerce (Washington 25, D. C.) has made available data covering Cast Iron Boilers and Cast Iron Radiation 1959. Subsequent releases will include information on manufacturers' shipments of electric heating equipment, steel heating boilers, warm air furnaces, steel and nonferrous radiation and a special report on the proportion of units of all types installed for purposes of replacement and repair.

School planning At the seminar on "Improving the Learning Environment" sponsored by Carrier Corporation, which took place in New York, N. Y. on June 29, a teacher, a superintendent of schools and an architect discussed teaching, school planning and costs and how they are influenced by air conditioning.

Status of fuels Arrangements are underway by the Fuels Division of the American Society of Mechanical Engineers for a three-day symposium to provide an up-to-the-minute, definitive look at the status of fuels today. To be held at Rutgers University, June 5-7, 1962, this symposium will present a series of technical papers covering developments during the past decade in coal, oil, gas and waste fuels.

Largest volume With a total of 1,163,000 sheets of paper and 2,326,000 press impressions, the current edition of the ASHRAE HEATING, VENTILATING, AIR-CONDITIONING GUIDE is probably the largest single volume produced by Waverly Press, according to the printer.

Proper handling Recent U. S. Department of Agriculture research on frozen vegetables shows no growth of bacteria at storage temperatures of 20 F or below. However, there was growth at 25 F and above and therefore there is the possibility of production of illness-causing by-products at these temperatures, as reported in the Information Bulletin of the Refrigeration Research Foundation (No. 60-6, June 1960).

Training committee Air Conditioning and Refrigeration Institute has appointed a training committee to help develop a program for teaching air-conditioning fundamentals in public school systems at both the high school and night school levels. This is part of a program to increase the supply of qualified service and installational personnel.

PARTS and PRODUCTS

1.5-HP HERMETIC COMPRESSOR

Adaptable for room and residential air conditioning, this lightweight compressor, Model F-2556, measures 11⅞ in. high, 10-13/32 in. wide and 8½ in. deep. Capacity of the 1.5-hp unit at normal rating condition is 16,300 Btu/hr. Compressor can be furnished for either 230/60/1 or 208/60/1 service and is available with two styles of mounting legs and with either top or side suction inlet. Also featured are an internal resilient mount and external mounts of either rubber cushions or springs to keep operating sound to a min.

York Div, Borg-Warner Corporation, York, Pa.

FAN, LIMIT CONTROLS

Featured in this new line are individual fan and limit controls and a combination of the two. All include switches incorporating innovations to provide longer field life and are equipped with color-coded switch guards for easy identification. Switches incorporate roller operators, have a rating of ¾ hp and are protectively enclosed with a moulded, non-conductive coating.

Fixed fan and limit settings are available in the new controls. To preclude change in settings due to vibration, tabs are provided to secure the levers at a preselected setting.
Robertshaw-Fulton Controls Company, 911 E. Broad St., Richmond 19, Virginia.

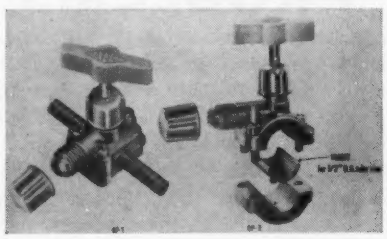
REDESIGNED CASES

Intended to make servicing of compressors easier, fronts on this line of refrigerated display cases have been redesigned. Two cases in the line are affected: the Angle Freezer, which is a sliding door counter-type case, and the Low Temp, an open type glass front self-service case.

Both models have compressors located in the non-refrigerated lower section, with the compressors mounted on tracks to permit fast pull-out for service. With the new design, the front panel is held in place with a continuous type hinge and swings up and out of the way to facilitate withdrawal of the compressor. Panels are equipped with a hooking device to keep them locked in an out-of-the-way position during servicing.
Bally Case and Cooler, Inc., Bally, Pa.

LINE TAP VALVES

Incorporating several new features, two adjustable line tap valves, AP-1 and 2, are cited as being easily attached to refrigerant lines for piercing the tube to provide a port for testing, charging, discharging or purging. Features include: a needle that cannot loosen and fall out, being an integral part of the shaft; handle made of Delrin attached to the shaft;



each valve incorporates an additional sealing cap to fit over the charging port; attachment to tubing from the top; and all sizes of tubing from 3/16 to ⅝ in. can be serviced with just these two valves.
Watsco, Inc., Hialeah, Fla.

WIRE FAN GUARDS

Ranging in size from 2½ to 73 in. diam, these welded wire fan guards protect personnel from whirling blades in such diverse applications as air conditioning blowers and electronic cooling equipment. Made of concentric rings or spirals, guards are electric resistance welded for max strength.
E. H. Titchener & Company, 57 Clinton St., Binghamton, N. Y.

EXPANSION JOINT

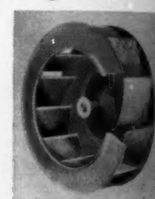
Controlling and compensating for thermal expansion and construction, this wrought copper joint has been designed for use with low pressure steam and hot water plumbing and heating lines. Expansion and contraction noises are minimized, pressure from pipings and joints is relieved, traveling pipe noises are insulated and the system is protected against damaging leaks, breaks and failures.

No maintenance is required and alignment problems are eliminated because of the flexibility and rotatability of the joint, which compensates for expansion and contraction movement of 100 lineal ft of copper tube. Designed for operation within a temperature range of from 40 to 240 F, the joint is factory tested to 150 psi.
Chase Brass & Copper Company, Waterbury 20, Conn.

AIRFOIL BLADED FANS

Designated Series 116, units in this new line of airfoil bladed centrifugal fans feature a low velocity radial rim wheel design for general ventilation and industrial process applications. Fans are available in 15 sizes in both single and double inlet designs.

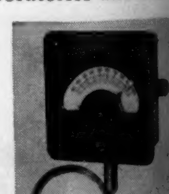
Air entering the fan inlet is accelerated gradually at the throat section. Radial rim wheel design (see cut) allows the air to expand over the entire blast width and pass over the airfoil-shaped blades at relatively low velocity with min turbulence. With this design, efficient pressure conversion through the wheel is cited as being achieved and boundary separation is reduced.



Blades on Class III fans are provided with formed steel and bar internal stiffeners, welded in place for extra strength and rigidity. Hubs in Class I and II fans are cast nickel iron, machined and riveted to the hub plate. Hubs in Class III fans are of welded steel fabricated construction.
American Radiator & Standard Sanitary Corporation, Industrial Div, Detroit 32, Mich.

TEMPERATURE CONTROL

Suited for ovens, test equipment, plant processes, laboratories and other industrial heating applications, this compact, remote bulb high temperature indicating control, Type E36N, combines accuracy and sensitivity over a range from 100 to 1000 F. Three models featuring three sensing bulb styles are offered.



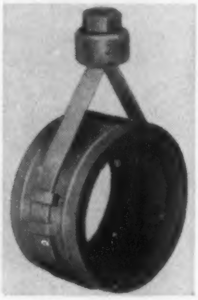
Reference between the setting and controlling temperatures is provided by a single scale with two pointers. Several switch actions are available, including normally closed, normally open and double throw. Ratings are

15 or 20 amp, 115/230 volt ac. All snap-action switches are single pole and suitable for up to 180 F ambient temperatures.
United Electric Controls Company, 85 School St., Watertown 72, Mass.

SOUND DAMPENER

Combination pipe hangers and sound isolators in this line can be used for both standard pipe and copper tubing sizes ranging from ⅜ to six in. Isolator is factory installed to the hanger.

Sound and vibration generated through movement of pipe by expansion, contraction, flow of liquids through piping or by equipment such as pumps, compressors, valves or regulators are cited as being eliminated. Isolator is made of a galvanized sheet metal cover formed with reinforced ribbing and a chemically processed high compression felt attached to the cover.



Elcen Metal Products Company, 9333 King St., Franklin Park, Ill.

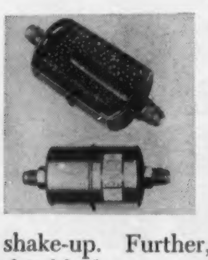
ALUMINIZED GLOVES

Three new types of gloves, designed to reflect 90% of all radiant heat in work where high temperatures are involved, have leather palms and aluminized asbestos backs and thumbs. Quite flexible, the material is light, fully insulating and is cited as neither cracking nor peeling even under the most severe working conditions.

Three types offered are: a five-finger carpincho leather glove, one-finger mitten of green heat-resistant leather and a five-finger glove of green heat-resistant leather.
Air Reduction Sales Company, Div of Air Reduction Company, Inc., 150 E. 42nd St., New York 17, N. Y.

BLOCK-TYPE FILTER-DRIER

Field testing of this new filter-drier, combining silica gel P. A. 400 and Molecular Sieve, is cited as having demonstrated that these desiccants, bonded in rigid form, will not permit separation under liquid surging or severe shake-up. Further, the structure of this block exposes max surface to the liquid flow and assures even distribution of filtered particles, resulting in filtration in depth, thus preventing rapid rise in pressure drop.



Full flow fittings of copper and brass minimize pressure drop through the connections. Copper fittings allow use of all commercial types of brazing materials for sweat connections, and brass flare fittings eliminate flare nut creep due to temperature changes of dissimilar metals.

Cross section illustration shows the desiccant block suspended in the shell with tension spring, additional filtering screen, filtering and shock pads in position.
Alco Valve Company, 865 Kingsland Ave., St. Louis 30, Mo.

COOLING UNIT

Model 430C-1 expands the Cool-Aire line of units for reach-in refrigerators to six models, ranging in size from 100 to 430 Btu/hr at one F TD. All standard features of the line are included in the new unit, which is mounted at the top of the refrigerator and discharges cold air against the back wall, thus drawing cold air

across the product. Uniform temperatures are maintained throughout the refrigerator, and door sweating and loss of refrigeration due to door opening are cited as being reduced greatly.
Bohn Aluminum & Brass Corporation, Danville Div, Danville, Ill.

VALVE SEAT RINGS

Designed as optional equipment for the company's line of 150 to 300-psi bolted bonnet steel valves in sizes from two through ten in., Teflon-inserted seat rings are now available. Substituted for one of the metal seating surfaces of a valve, they are cited as giving a tighter closure than is possible with a metal-to-metal seal.
Walworth Company, 750 Third Ave., New York 17, N. Y.

REMOTE TYPE UNITS

Seven sizes of remote, individual room Seasonmakers are now offered, with capacities ranging from 220 to 1240 cfm. Of slim lined design, units are compact and require a min of installation space. Four models are offered: floor, basic, hideaway and ceiling. Small sizes are equipped with 1050 rpm motors, larger sizes with 1500 rpm motors.

Control packages and wall plates for hideaway and ceiling models are available. All units have large piping compartments and are designed with slide-out fan decks for servicing and maintenance.
McQuay, Inc., 1600 Broadway St. N.E., Minneapolis 13, Minn.

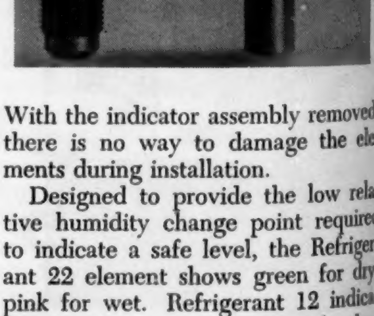
3- AND 5-TON MODELS

Added to the line of Year Round Comfort Equipment are a three and five-ton model Remote Air-Cooled Condensing Unit, featuring compact design and quiet operation. Units come equipped with a 28-in. belt-driven condenser fan, or twin condensers in the five-ton model, designed for extremely slow speed with heavy duty capacity for even extreme temperatures.

Standard components are: glass fiber insulation on all interior surfaces, rubber sound absorbers, high capacity compressors externally spring-mounted, and contactor and pressure control packages.
Bar-Brook Manufacturing Company, Inc., Shreveport, La.

MOISTURE INDICATOR

Combining a Refrigerant 12 indicator, a Refrigerant 22 element and a sight glass in one interchangeable assembly, the "200" Dry-Eye screws out of its brass body in one piece to permit soldering of sweat connections.



With the indicator assembly removed, there is no way to damage the elements during installation.

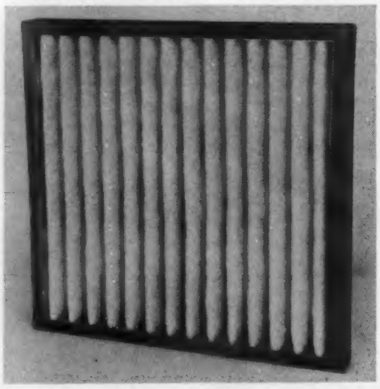
Designed to provide the low relative humidity change point required to indicate a safe level, the Refrigerant 22 element shows green for dry, pink for wet. Refrigerant 12 indicator shows blue when dry, pink when wet, and is cited as working equally well in systems using Refrigerants 11, 13, 113 and 114.

Indicator body is a one-piece brass forging available in all standard sizes, flare and sweat, in both in-line models

(at left in the cut) and T models (at right).
Ansul Chemical Company, Marinette, Wisc.

AIR FILTER

In design, the Pure-Air extended surface filter consists of two-in. high pleats set on 1¼-in. centers. Each pleat is supported rigidly by a strip of cardboard set on edge and, under



the influence of the air stream, becomes a parabolic-shaped pocket. Because of this shape, least resistance to air flow is at the back of the pocket, resistance gradually increasing up the sides. Large particles of dirt in the air stream, unable to change direction because of their inertia, lodge at the back of the pocket. Finer particles, able to change direction, are deposited on the sides. Air travels through the sides of the pocket at an angle, going through a greater thickness of material and increasing filtering efficiency.
Arco Manufacturing Corporation, 542 W. 55th St., New York 19, N. Y.

RUST INHIBITOR

Ready to use without mixing, Poly-Rustex can be applied to any metal surface by a variety of methods: brush, spray, mop or dip. A combination of active materials dispersed in an oil carrier base, the compound penetrates through existing corrosion to the bare metal, forming a solid air and moisture-tight seal to prevent formation of new rust. It is low in viscosity, non-settling and non-freezing, permitting storage indoors or out in any weather.
Brad Chemical, Inc., 111 W. Washington St., Chicago 2, Ill.

FINAL DRIVE UNIT

Designated Type 77MS, this pneumatic final drive unit to position valves, dampers and other control devices on heating and processing equipment develops up to 400 lb-ft of operating torque and 800 lb-ft stall torque with 45 psig air supply. It can be controlled pneumatically or electrically.

Middle range of torque values is covered by the 77MS; Model 77S handles loads to 140 lb-ft and 77L to 2400 lb ft. Drive lever rotation of the unit is 75 deg and lever can be mounted on either end of the output shaft at 10 deg increments.

Accessories available are automatic air failure lock, combination air pressure reducing valve and filter, limit stops, limit switches, strip heater with thermostat and position indicating quadrant with pointer.
Republic Flow Meters Company, 2240 Diversey Pkwy., Chicago 47, Ill.

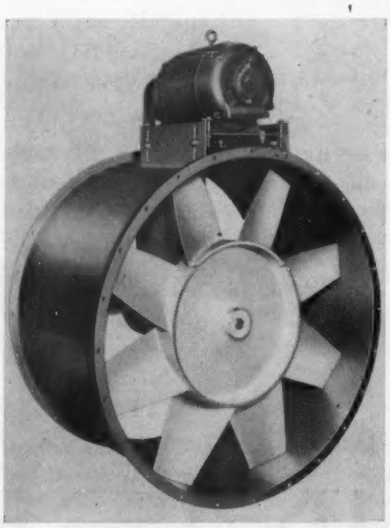
ADD-ON COOLING COIL

Low cabinet featured on this three-ton add-on cooling coil permits it to be added to an up-flow forced air furnace without greatly increasing the overall height of the installation. "A" type coil projects up into the plenum space. Duct connection can be made at a lower level than is possible with conventional full cabinet coil units.

Coil has 3.44 sq ft net face area, rippled edge aluminum fins that are flat-bonded to seamless copper tubes and has been tested underwater at 400 psi. It is equipped with a thermostatic expansion valve.
Lennox Industries, Inc., Marshalltown, Iowa.

AXIAL FLOW FANS

Since ventilation systems are frequently altered during their life, usually to increase capacity, this manufacturer has developed a line of

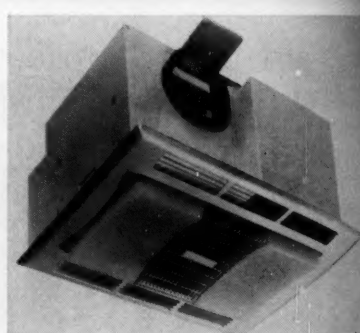


belted axial flow fans to simplify this change. Regardless of initial hp ordered, a new bearing assembly suitable for loads to 50 hp is furnished with each fan in the line. Another construction feature is a universal motor mounting plate, pre-drilled for all motor frame sizes the fan can accommodate. Both standard and high pressure propellers are available, depending on system requirements. Fans range from 30 to 60 in., supplementing smaller units already in the line, and air deliveries are available to approximately 85,000 cfm.
Propellair Div, Robbins & Myers, Inc., Springfield, Ohio.

CEILING-MOUNTED UNITS

Three different models are included in this line of ceiling-mounted residential electric heating equipment, suited for easy installation in kitchens or bathrooms. Each unit mounts in a recessed position into the ceiling so that only the grille is visible.

Combining in one unit a 1200-watt heating capacity, two 60-watt lamps and a 175-cfm fan, a heater-light-fan model (shown) can be mounted between joists and saves installation time of separate fixtures. A 5¼-in. diam squirrel cage blower circulates heated air and exhausts stale



air; horizontal exhaust can be adapted to any standard four-in. round duct. Allowing separate use of the heater, light and fan, a special wall switch has an indicator light to show when the heater is on. A compact heater and light unit, rated at 1200 watt, and a unit with heater only, rated at 1000 watt, are also available.

All ceiling model electric heaters include built-in thermal protection devices that turn the unit off to prevent overheating. Frames snap out and hang from springs for lamp changing and cleaning.
Westinghouse Electric Corporation, Air Conditioning Div, Staunton, Va.

ROLL-TYPE MEDIA

Coming in kit form for assembly at the point of installation, Manual Roll-Kleen carries media rolls 70-ft long in the proper widths for three, four or five-ft wide filter sections. Unit heights range from five to 15 ft in

increments of four ft. Each filter section is shipped knocked down for assembly at the job site and two or more sections can be bolted together.

Media are changed quickly by the manual wheel, which rolls used media down across the face of the filter to the lower disposable roll. Maintenance is infrequent. Units are designed to operate in a pressure differential range from 0.3 to 0.6 ft wg and from 350 to 500 fpm.

Farr Company, P. O. Box 90187, Airport Station, Los Angeles 45, Calif.

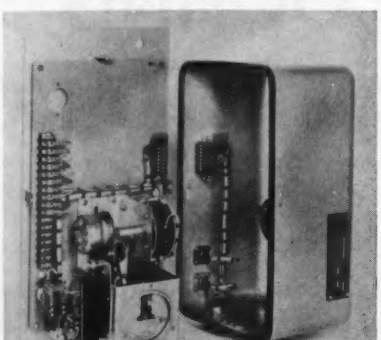
BOILER-BURNER UNIT

Cited as operating at more than 80% efficiency and reducing installation head room by as much as 24 in., this boiler-burner unit (gas or oil-fired or both) is designated Petro-Pac. Consisting of a burner meshed into a firebox type boiler, this forced draft package unit will service steam or hot water requirements of buildings containing from 6000 to 60,000 sq ft of floor space. Features are: pressure firing eliminating chimney or smokestack, elimination of the refractory combustion chamber, sealed combustion system and factory packaging for immediate installation.

Petro, 3170 W. 106th St., Cleveland 11, Ohio.

BTU METER

Function of this meter in a heating or cooling system is to measure the volume or weight of the heating or cooling fluid and determine the tempera-



ture difference between fluid entering and fluid leaving the system. Computing the product of these two factors provides total Btu or the exact quantity of heat removed or added.

This sweep balance Btu meter, for use in the processing industries as well as in apartment and office buildings, requires no amplifiers, utilizes electrical resistance thermometers and an electromechanical computing device, and can be used for cooling systems where the temperature difference is only a few deg F. Accessories available include a remote counter or a strip chart recorder that can be placed any distance from the integrator. A separate control panel is also available for use where a predetermined number of Btu are needed to activate external circuits used to operate other equipment.

Air Conditioning Equipment Corporation, 219 E. 44th St., New York, New York.

HORIZONTAL FURNACE

Now available in horizontal form for use in homes and small commercial buildings, the Custom Mark II oil-fired furnace can be installed in areas not ordinarily used. Major reason for this is its volumetric combustion system, which eliminates the need for a chimney, requiring only a vent to handle exhaust. Suggested methods of installation include: beneath the floor in a home without a basement, hung from floor joists, suspended close to a ceiling in a basement or utility room, in an attic or in an attached garage. In commercial installations the furnace can be suspended from the ceiling in any spot and operated with or without ducts.

Six heating capacities are available, with an output rating at the bonnet of from 84,000 to 250,000 Btu/hr. Designed for No. 2 oil, the furnace includes standard equipment as follows: built-in oil burner with integral draft fan, two-stage fuel unit and solenoid oil valve; circulating fan, motor and safety stack switch; standard thermostat: two-wire, heat anticipating low voltage type; combination fan and limit control; one filter and filter rack on Models FID-84, 95 and 110, two on models FID-140 and 180 and four built-in filters on model FID-250.

Iron Fireman Manufacturing Company, 3170 W. 106th St., Cleveland 11, Ohio.

BUILT-IN CONTROL

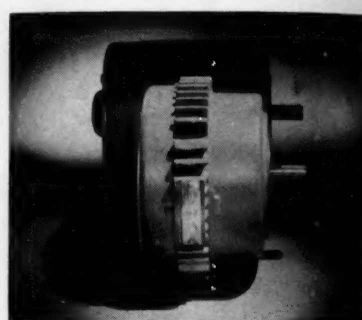
Factory-installed in Bypass Weathermaster units, a newly-developed control powered by the conditioned air itself proportions air flow through the cooling-heating coil while water flow remains constant. Previous room terminal units required purchase of separate water flow controls, plus added cost of pneumatic piping.

In addition to the bypass control, the new Weathermaster's discharge grille sections are locked in place to prevent tampering. A redesigned cooling coil arrangement permits easier cleaning from the front of the unit. Flexibility is offered through a choice of five different nozzle arrangements, matching variations in load and ventilation requirements of all-glass structures, existing buildings with moderate glass areas and structures with low sensible heat loads and high ventilation requirements.

Carrier Corporation, Syracuse, N. Y.

COMPACT MOTOR

With Nema type "C" face mounting, this new Thinline motor is designed for use on pumps, gears, hoists and propeller-type fans. Both drip-proof and totally enclosed constructions are available in ratings from one through



five hp at 1800 rpm, ¾ through three hp at 1200 rpm and ½ through two hp at 900 rpm.

Compact design of the motor reduces over-hang and allows for compact equipment design. Its light weight makes it easy to install.

General Electric Company, Schenectady 5, N. Y.

WATER-BASED FLUXES

Featuring instantly soluble and non-charring residues, these non-resinous water-based fluxes, designated Organo-Fluxes, are available in four grades to provide sufficient activity for most jobs while holding residues to a min for the soldering speed required. Grade descriptions are: 3355, red, for fast action and medium residue; 2133, pink, for rapid action and moderate residue; 3133, pink, for medium action and min residue; and 735, blue, for medium action and light residue.

London Chemical Company, Inc., 1535 N. 31st Ave., Melrose Park, Ill.

INSULATING FOAM

Designed to provide the refrigeration industry with a low cost, one-shot, rigid polyurethane foam for low temperature insulation, Nacconate 4040 is now available in developmental quantities. Dimensional stability is cited as being excellent.

National Aniline Div, Allied Chemical and Dye Corporation, 47 West St., New York 6, N. Y.

JOURNAL
OFFICIAL PUBLICATION
AUGUST 1960

An air-cooled absorption cycle

R. H. MERRICK
Member ASHRAE

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This paper covers a specific type of air-cooled absorption refrigeration cycle with application to air conditioning equipment now in production. This unit is manufactured in 3 and 4½-ton sizes. It comprises an outdoor, air-cooled water chilling section, as shown in Fig. 1, which circulates chilled water to furnace, duct or fan coils serving the conditioned space.

Design objectives called for an air-cooled, hermetic absorption cycle. A new cycle development was required as a review of familiar cycles disclosed the following limitations:

1–Cycles evolving from the lithium bromide water combination require low absorber temperatures which cannot be maintained practically by air cooling.

2–Cycles employing halogenated hydrocarbon refrigerants fail on one or more of the following points:
   a. Air cooling is not practical
   b. Poor chemical stability and/or compatibility with ordinary materials of construction
   c. Exorbitant solution heat exchange and pumping requirements

3–The Platen-Munters, ammonia-water-hydrogen cycle has poor heat transfer rates and geometric limitations

4–The conventional ammonia-water cycle has thus far not been hermetic owing to pump shaft seal and has not been fully exploited thermodynamically

This review disclosed a potential in an air-cooled ammonia-water combination if a hermetic circulation means were developed and performance-improving heat exchange relationships introduced. In the description to follow, the solution return trap and the solution cooled rectifier piped in parallel with the heat exchanger answer these conditions.

Cycle Description—The cycle is diagramed in Fig. 2. To be consistent with previous absorption refrigeration literature terminology, in this paper strong solution is that rich in solute, which in this case is ammonia. Weak solution is, therefore, poor in ammonia.

Strong solution entering the generator is heated and the resulting vapor and weak solution are separated in the separator. The vapor, a mixture of ammonia and water, leaves from the top of the separator and travels to the analyzer across the top of the generator reservoir. It passes through the analyzer in intimate contact with returning strong solution, approaching equilibrium with the solution and leaving richer in ammonia.

Here is a newly developed air-cooled absorption cycle being used in 3 and 4½-ton gas-fired air conditioning equipment. Ammonia-water is the refrigerant-absorbent combination. Unusual features of the cycle are the use of a hermetic transfer device to circulate solution and a solution-cooled rectifier piped in parallel with the heat exchanger to improve cycle efficiency.

A new cycle development was required as a review of familiar cycles disclosed too many limitations, as pointed out by the authors.

R. H. Merrick is Chief Engineer, R. A. English is Senior Development Engineer, Gas Air Conditioning, Bryant Manufacturing Company. This paper, here somewhat condensed, was presented at the ASHRAE 67th Annual Meeting, Vancouver, B. C., June 13-15, 1960. The complete paper will appear in TRANSACTIONS.

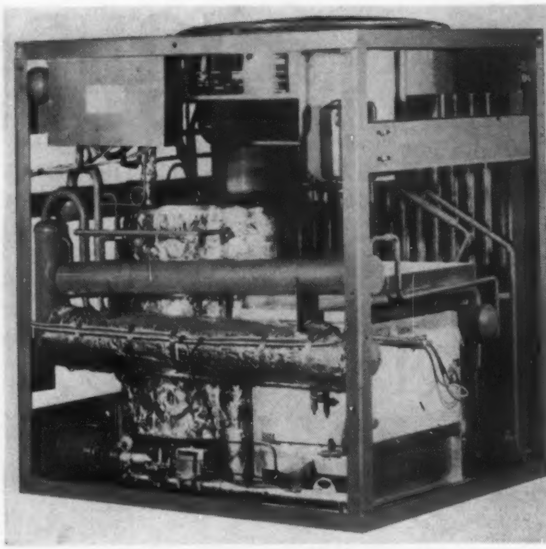


Fig. 1 Outdoor, air-cooled water chiller section

Then the vapor passes through the rectifier where it is cooled and partially condensed by returning strong solution. The condensate has a high percentage of water so the leaving vapor is now nearly pure ammonia. The ammonia is then condensed in the condenser and passes through a fixed restrictor to the chiller. Here the refrigerant vapor then goes into the bottom of the absorber.

The hot weak solution that leaves the bottom of the generator separator passes through the heat exchanger where it gives up its heat to returning strong solution not used to cool the rectifier. It is then metered through a fixed restrictor into the subcooled absorber and to the bottom of the absorber. Here it comes in contact with the vapor from the chiller.

Absorption takes place as the two mix and rise through the absorber. The resulting strong solution then stores in the inlet tank. Some absorption takes place in the subcooled absorber, making use of the fact that the weak solution entering is subcooled and able to absorb vapor without the benefit of heat transfer surface.

The strong solution is then returned to the generator by means of the solution return trap. In flowing to the generator the solution is split into two parallel flows, part cooling the weak solution in the heat exchanger and the remainder purifying the vapor in the rectifier and analyzer. Solution cooling of the rectifier eliminates the additional input that would be required to replace heat rejected by an externally cooled, e.g. air-cooled, rectifier. Furthermore, the parallel flow split most closely approaches conditions of reversible heat transfer resulting in minimum heat exchanger and rectifier sizing for specified results.

The solution return trap is one of the most unusual features of this cycle. This is a hermetic transfer device which uses heat as the driving energy and automatically adjusts its operation to the varying

Fig. 2 Cycle diagram

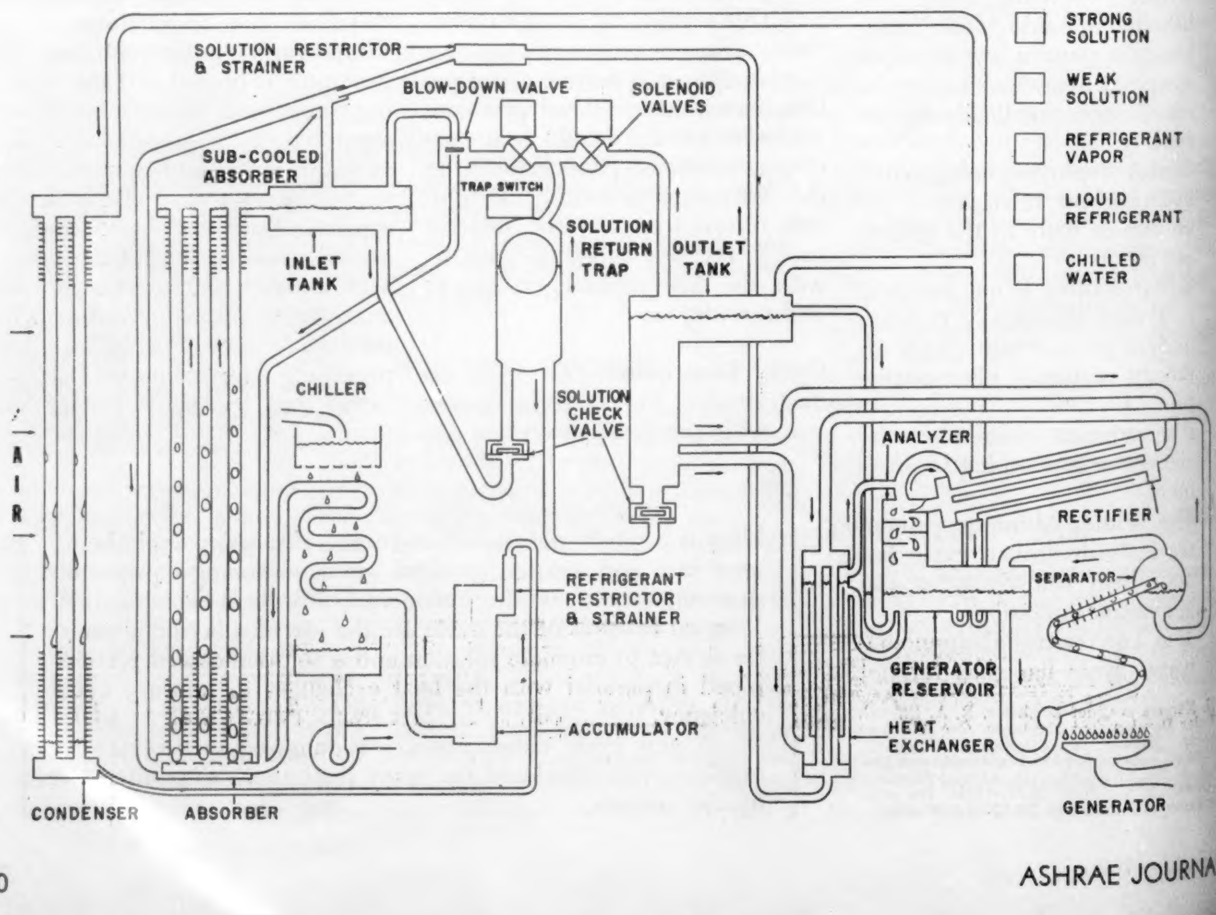


TABLE I—CYCLE CONDITIONS

Location	Pressure psia	Temperature F	Concentration Liquid $\%H_2O$	Concentration Vapor $\%NH_3$	Calculated Weight Flow Lb/Min/Ton
1. Weak Solution Leaving Generator	286.4	305	78.0	76.5*	2.150
2. Weak Solution Leaving Heat Exchanger	286.4	170	78.0	—	2.150
3. Vapor Leaving Analyzer	286.4	257	—	91.0*	—
4. Vapor Leaving Rectifier	286.4	175	—	99.2*	.488
5. Liquid Leaving Condenser	286.4	110	0.8*	—	.448
6. Vapor Leaving Chiller	69.0	52	—	100.0*	—
7. Liquid Residue Leaving Chiller	69.0	52	23.0*	—	—
8. Strong Solution Leaving Absorber	69.0	137	63.6	—	2.640
9. Strong Solution Leaving Trap	286.4	137	63.6	—	2.640
10. Strong Solution Leaving Rectifier	286.4	245	63.6	93.4*	—

*Values read from property tables.

flow rates of the individual cycle.

The trap is essentially a chamber located at an intermediate elevation between the absorber, above, and generator, below. It is first valved to the absorber to admit solution which flows in by gravity head, and then valved to the generator to empty solution. Separate lines are used to convey liquid and displaced vapor. The vapor lines are controlled by solenoid valves while the liquid lines have check valves. The central chamber has a float which signals via a magnetic switch when the chamber is full. This operates the solenoid valves. A timing circuit allows a fixed period for the chamber to empty.

When the low side valve is open, equalizing the chamber to the inlet tank, solution flows into the chamber through the low side check valve. When the chamber becomes full, the magnetic switch closes the low side solenoid valve and opens the high side solenoid valve. The pressure in the chamber then equalizes with the generator, closing the low side check valve, and allowing the solution to flow through the high side check valve into the outlet tank.

The timing circuit reverses the solenoid valves when the chamber is empty. When the chamber pressure is equalized with the absorber, the filling process will begin. Prior to this last equalization, the chamber contains a volume of high pressure vapor equal to the volume of liquid which was transported. This high pressure vapor is then dumped into the absorber during equalization. The blow-down valve, which is a double acting check valve, is used to divert the bulk of this vapor into the bottom of the absorber where it is readily absorbed.

Since this vapor goes directly from the generator to the absorber and by-passes the refrigerant circuit, it requires additional generator heat input. This additional input is the energy required to pump the solution in this cycle.

Cycle Performance—Pressure temperatures and concentrations measured from actual cycle performance in air conditioning equipment have been used in calculating the cycle coefficient of performance (COP), the trap operating energy and heat transfer component efficiencies.

Table I lists these values for rated chiller performance on 95 F DB, 75 F WB entering air, producing 44 F chilled water at 2.5 gpm per ton.

1—COP:

If a heat balance is made around the generator, analyzer, rectifier and heat exchanger as a group, the cycle COP can be calculated.

The calculated value is .462 and includes the trap operating energy which amounts to 8.36% of the total cycle input. It does not include vagrant heat losses from the cycle or any efficiency involved in converting fuel to actual generator heat input.

2—Trap Operating Energy:

Ideally, the trap allows a volume of vapor equal to the volume of strong solution transferred to go directly to the absorber from the rectifier, by-passing the refrigerant circuit. Actually, the trap never completely fills with solution so that a volumetric efficiency must be applied, which in this case, has been measured at .96.

In equipment where this cycle is used, a trap efficiency of less than 96% is realized which, of course, increases the trap operating energy value and correspondingly decreases the COP value calculated previously. The magnitude of this disparity is a design variable associated with an absorption-desorption process occurring during trap operation. While emptying, high pressure vapor is absorbed into solution residues in the float chamber and later released when the chamber is equalized to the absorber pressure.

CONCLUSIONS

The discussion has been directed specifically at the operation of the cycle and has avoided construction details of the cycle and the air conditioners in which it has been applied. It should be recognized that actual air conditioner performance will vary from calculated cycle performance according to the magnitude of the trap loss, flue loss, jacket loss and cooling side motor energies, which are design variables outside the scope of this paper.

It is natural to wonder about cycle performance with a pump replacing the solution return trap. This can be readily calculated once a pump performance is assumed along with relative costs of heat and electrical energy. However, this is a difficult high-head, low-flow pumping job involving a saturated liquid with approximately the viscosity of water. Pump performance assumptions could be extremely hypothetical.

NEXT ASHRAE MEETING
CHICAGO: FEBRUARY 13-16

Headquarters for the 1961 Semi-annual Meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers will be the Conrad Hilton Hotel in Chicago.

Held concurrently with the ASHRAE Meeting will be the 15th International Heating and Air-Conditioning Exposition at the Chicago International Amphitheatre.

Specific

Thermoelectric devices

can fill some gaps in heat transfer problems

During the past several years a great deal of interest has been shown in the field of thermoelectricity, both in the thermoelectric conversion of heat into electricity and in the pumping of heat by thermoelectric means. Fig. 1 is a schematic description of these two phenomena.

BACKGROUND

The basic concepts of thermoelectric (TE) conversion and heat pumping were discovered early in the last century by Seebeck and Peltier. Until recently a surprisingly small amount of research had been conducted in the field. This is rather startling when we realize that at one time TE conversion was equal in efficiency to the best rotary machinery and at one time TE cooling would have been the only practical form of refrigeration below the freezing point of water.

For years these two effects were merely laboratory curiosities, the first application was the use of metallic thermocouples in thermometry. The first commercial use, in the early 1930's, was in gas appliance burner controls. It was not until the 1940's, when TE semiconducting materials were first formulated and measured, that researchers could see TE products over the horizon.

In 1948 a research group, headed by Dr. S. Karrer, at Baso Inc., initiated a search for TE materials having exploitable properties. This group found that by suitably doping lead telluride, a binary compound, highly efficient TE materials could be obtained.

Lead telluride was then incorporated into a thermocouple, powering a gas furnace control system; and this is still the only mass-produced commercial thermoelectric device using semiconducting materials.

This research work, dating back to 1948, is being expanded at Minnesota Mining & Manufacturing Company and has resulted in the development and sale of new semiconducting materials for use in heat pumps as well as generators; the SNAP III generator, a line of similar generators for sale (Fig. 2), commercial elements for prototype studies, a heat pump test kit for educational use, and several heat pump devices which will be described later.

TE semiconductor materials are developed for a given temperature range of use; thus PbTe appears to be one of the better materials for use below 1200 F, whereas Bi_2Te_3 type materials are more suitable for use below 500 F and

WILLIAM HUCK

since most heat pump applications fall in the low temperature range, the latter compounds are more commonly used. It would be unreasonable to presume that PbTe and Bi_2Te_3 are the ultimate TE materials; we should expect superior materials to be developed in the future.

The interest in thermoelectricity today is divided between those wishing to pump heat and those wishing to generate electricity. There are many similarities in these two fields; the same general types of materials are used, the same physical parameters are of interest, and the same physical theory encompasses both. The major difference is in goal. A thermoelectric generator is a conversion device,

"The interest in thermoelectricity today is divided between those wishing to pump heat and those wishing to generate electricity. . . . There are many similarities in these two fields; the major difference is in goals. . . . Several companies have built heat pump devices ranging from bottle coolers and warmers to room air conditioners. Although appliances such as these are not merely scientific curiosities, they are still not economically feasible. . . . The reasons for high costs are that laboratory rather than production methods have been used to date and only small quantities are being produced. . . ."

W. Huck is Applied Research Supervisor, Thermoelectric Products, Minnesota Mining and Mfg. Co. This paper, here slightly condensed, was presented as "A Simplified Engineering Approach to Thermoelectric Heat Pumping" at the ASHRAE 67th Annual Meeting, Vancouver, B. C., June 13-15, 1960. The complete paper will appear in TRANSACTION.

one that converts thermal energy directly into electrical energy, while a thermoelectric heat pump is an energy transfer device, using electrical energy to transport thermal energy from one point to another.

THEORY

The three physical properties which are of importance when discussing heat pump materials are: the Seebeck coefficient (S), the electrical resistivity (ρ), and the thermal conductivity (k). All three properties can be and generally are functions of temperature which explains why a material with good performance in one temperature range may be poor in another. The performance of TE materials is related to S^2/k_ρ; a quantity commonly referred to as the figure of merit.

Physical, chemical, and metallurgical studies are being conducted in an effort to increase the figure of merit and although S, ρ, and k are not completely independent of one another, some progress is being made in lowering k for a given S and ρ.

TE heat pumps are assemblages of "N" and "P" type materials (Fig. 3) which are connected in series electrically. Each conduction electron in the "N" type material carries a small amount of energy away from the absorbing electrode and each hole in the "P" type material does the same; the net result is the lowering of the absorbing junction temperature.

The following energy flow equation describes the steady state conditions at the absorbing junction and applies to either the "N" or "P" leg of the heat pump:

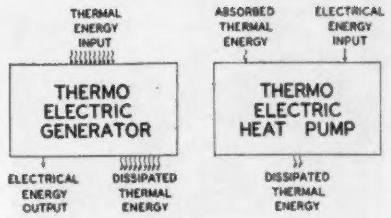


Fig. 1 Energy flow for thermoelectric conversion and heat pumping

S — Seebeck coefficient—90 to 130 μV/F.
T — Dissipating junction temperature—R
ΔT — Temperature difference across element—F
I — Direct current through element—amp
ρ — Electrical resistivity—300 to 600 $\mu\,\Omega$ in.
(L/A) — Ratio of element length to area—in.$^{-1}$
k — Thermal conductivity — 0.012 to 0.02 watts/in. F
Rc — Contact resistance — 10^{-4} to 10^{-5} ohm

Academically detailed discussions of the heat pump equation may be obtained from many sources (see reference list). Although S, ρ, and k are functions of temperature, one may assume that for the ΔT's involved in heat pumping, use of average values will not seriously affect the accuracy of the above equation.

From the equation it is apparent that we would like S to be large and ρ, k, and Rc to be small. The functional dependence of Q on I, (L/A) and ΔT, is not easily seen but will become obvious when the experimental data are viewed.

If the contact resistance were zero, the only way in which the thermoelectric element geometry enters is in the form of a ratio, length/area (L/A), thus implying that for constant L/A a small element will perform as well as a large element, i.e., pump the same quantity of heat at the same ΔT for the same current. Therefore, the heat pumped per unit area from the cold junction increases as the element decreases in size.

Carrying this reasoning to its logical conclusion, it would seem possible to pump an ever increasing amount of heat per unit area by decreasing the element size. The practical limitation to miniaturization is the existence of a finite contact resistance Rc which increases as the cross-sectional area of the element decreases. Since the choice of physical size can be quite arbitrary, workers in the field have used 1/16 to ½ in. diam elements. 3M Company has thus far standardized on two diameters: 3/16 and 9/32 in.

To the first approximation, curves of ΔT vs. I at constant values of Q will be quadratic as in Fig. 4. That portion of the curve beyond the maximum ΔT is of no interest since performance suffers when the current is raised above the optimum value. Note that to the expression "optimum current" must be added one of the qualifying expressions, at maximum ΔT, at maximum Q, etc., since the optimum current may differ in each case.

Experimentally optimizing the heat pump geometry results in the discovery that better performance, i.e., higher Q for a given ΔT, is obtained for low values of L/A with correspondingly higher current requirements. Since supplying as well as handling large currents is objectionable, most TE heat pump devices utilize elements having L/A values in excess of 4 in^{-1}.

ENGINEERING DATA

The experimentally determined relationship of temperature difference ΔT, heat load Q, and current I, is shown in Fig. 4. A brief description of the method used to obtain this data follows:

A small copper cylinder containing a heater coil is mounted at the heat absorbing (cold) junction

$$Q = S(T - \Delta T)\,I - \frac{I^2 \rho\,(L/A)}{2} - \frac{K\,\Delta T}{(L/A)} - I^2\,Rc$$

Joule heat at absorbing junction contact

Thermally conducted heat

Joule heat in body of element delivered to absorbing junction

Peltier heat absorbed

Net amount of heat absorbed from environment—watts

of the heat pump couple which is to be tested. The heat dissipating (hot) junctions of the elements are fastened to a heat sink held at 81 F (81 F = 300 K, which has become the accepted reference temperature). Material properties vary with temperature in such a way that performance falls off at lower temperatures and picks up at higher ones. For example, with a given heat load (Q) a ΔT approximately 25% greater can be obtained when the dissipating junction is held at 212 F or 373 K.

The temperature difference or ΔT is a function of both the heat input or heat load to the copper cylinder and the pumping current. In Fig. 4, the ΔT falls off with increasing heat load. A family of curves cross-plotted from Fig. 4 type data is shown in Fig. 5; each line corresponding to a particular element geometry.

These data, being actual experimental data, include contact resistance, the effects of the material constants, and all temperature dependencies.

In Fig. 5, each curve is a straight line and can be easily fit with a simple empirical equation:

$$\Delta T = 110\text{ F} - \beta Q$$

Here β is the slope of a given curve and is primarily a function of the geometry, i.e., a function of (L/A). The maximum ΔT under no load conditions can be raised higher than 110 F by using better thermoelectric materials or by using larger elements, thereby lessening the effect of contact resistance.

Before trying to solve a typical heat pump problem, some of the design limitations not apparent in Fig. 5 should be mentioned.

All the heat that is pumped from the cold junction plus all the loss in the body of the element must be removed from the hot junction; this can be a problem, especially if small elements are placed close together in order to pump a great deal of heat from a given area. Sufficient heat sink and dissipation means must be provided.

An illustration may be looked upon as being a black box which transfers energy from one side to the other, and which costs ($I^2R + S\Delta TI$) units of energy to run (power required in watts – Fig. 1). The cold side of the box absorbs Q units of thermal energy while Q + $I^2R + S\Delta TI$ units of thermal energy are emitted from the dissipating side of the box.

The coefficient of performance for cooling systems can now be defined as

$$\frac{Q}{I^2R + S\Delta TI}$$

The COP for practical thermoelectric cooling systems will generally lie between 0.1 and 2, depending primarily on the temperature difference. Under similar conditions of heat load and ΔT this will be equal to or greater than the COP for an absorption refrigeration system.

Supplying power to drive heat pumps is somewhat of a problem since they are inherently low voltage and high current devices. In addition, reasonably flat dc is desirable; the performance would suffer if the ac ripple were in excess of 20% of peak value.

PROBLEM

Operation of an electronic component at 60 F when the best heat sink in the vicinity is at 70 F. The internal load of the component is 25 watt. A 31-amp power supply can be made available.

SOLUTION

The 25-watt load must be pumped up a 10 F temperature gradient; this of course cannot be done with

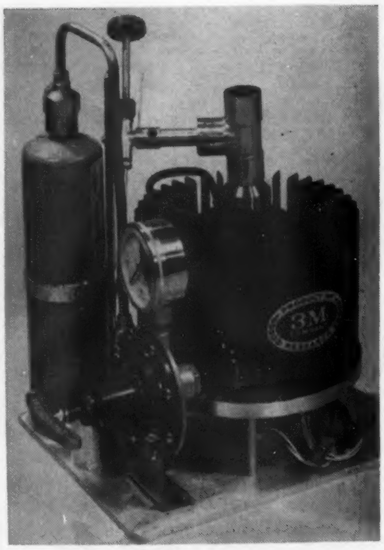


Fig. 2 5 watt propane fired thermoelectric generator

Fig. 3 Schematic heat pump where the absorbing junction is the cold junction electrode. Electrical carriers are holes in the P-type material and electrons in the N-type. In both legs of the heat pump the carriers transport thermal energy away from the absorbing electrode

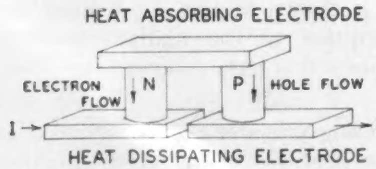


Fig. 4 Temperature difference across heat pump at various heat loads as a function of supply current

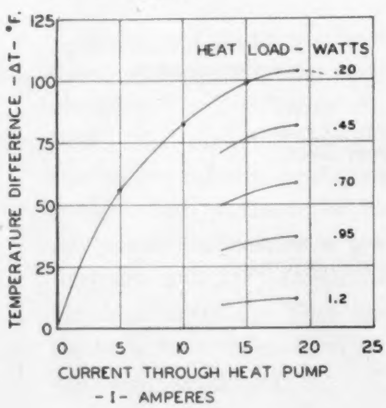


Fig. 5 Experimentally determined heat pump load line graph. Each line corresponds to a different element geometry distinguished by the ratio length/area. 1 watt = 3.42 Btu/hr = .239 cal/sec

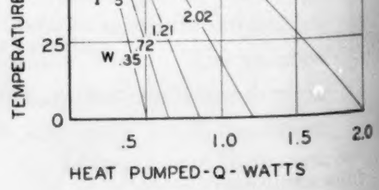
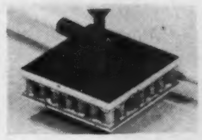


Fig. 6 Spot cooler used on fluorescent lamps to adjust internal mercury pressure and thus maximize light output

Fig. 7 A 2 in. square flat plate cooling module which may be mounted between the component to be cooled and any suitable heat sink



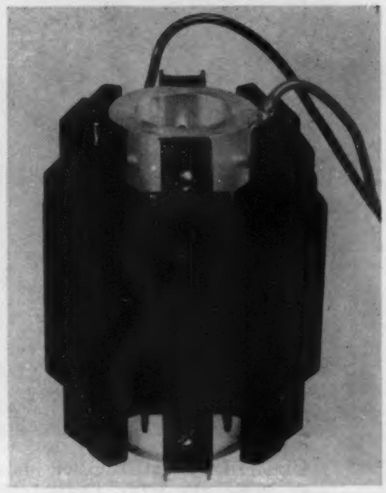
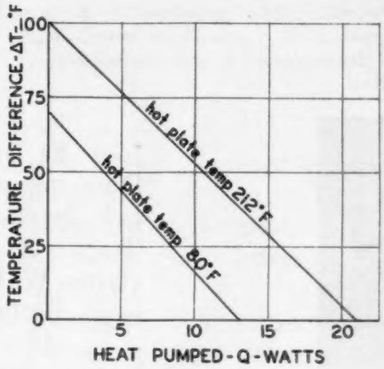


Fig. 9 Cylindrical cavity cooler with capacity in excess of 10 watt. Cavity 1½ in. diam and 3 in. long

Fig. 8 Operational data on the flat plate cooler. The temperature difference is that between the top and bottom plate



one heat pump couple, however, many couples can be assembled in series electrically, each sharing a portion of the thermal load. The electrodes will have to be electrically insulated from one another and from the heat sink. When 25 watt are transferred through thin electrical insulating films, the additional temperature drop may easily be 5 F. This means we need a total ΔT of 15 F across the elements.

A 31 amp power supply is best suited to elements having a length/area ratio of 4 in.$^{-1}$ (Fig. 5), and couples having this geometry will pump 1.72 watt with a ΔT of 15 F. Thus, in order to pump 25 watt at least 15 couples are needed. The operating cost of the cooler will be 15×2.69 (Fig. 5) or approximately 40 watt. The heat sink must be capable of absorbing $40 + 25$ or 65 watt.

PRESENT HEAT PUMP DEVICES

Several American companies have built heat pump devices ranging from bottle coolers and warmers to room air conditioners. Although appliances such as these are not merely scientific curiosities, they are still not economically feasible. It should not be long before small refrigerators and dehumidifiers are seen on the market, but at the present time it appears that the field will be limited to smaller industrial applications.

As an example, high power outdoor fluorescent lamps run so hot during most of the year that the contained mercury pressure goes above the optimum level with an accompanying drop in light output. A properly designed heat pump can be used to cool a small spot on the surface of the lamp, condensing mercury vapor and raising the light output to its rated value.

In this way a few watts supplied to the heat pump result in a considerable increase in light output from the lamp. A lamp cooler developed in conjunction with the Line Material Industries is shown in Fig. 6; it cools an area of ½ in.^{2} The light output of a standard Line Material Industries 4 lamp street lighting luminaire was increased 72% under standard rating conditions.

A flat plate cooler shown in Fig. 7 is designed to be fastened to a chassis or any other heat sink. Small electrical components attached to the upper surface may then be cooled. Operational data are shown in Fig. 8.

Another device shown in Fig. 9 is designed to cool or heat a cylindrical cavity. The cavity may contain passive items such as crystals or active electrical loads up to 10 watt.

Of the many commercially available refrigerated appliances, none at the present time utilizes the TE phenomenon. There can be only two reasons for this: lack of either technical or economic feasibility. With the latest materials, temperature differences up to 125 F have been obtained in our laboratory from a single stage dissipating to an 81 F (300 K) environment.

Thus, it might appear that TE devices are not widely used because of economic reasons. This is largely true, present material and assembly costs place this new system out of many markets. In most cases assembly and handling costs outweigh materials costs. Improved materials can and will mean simpler and cheaper assemblies. The reasons for high costs are that laboratory rather than production methods have been used to date and only small quantities are being produced. It is possible, however, that automated production could break this economic barrier.

Approaching the problem from the opposite direction, presently used semi-conducting materials are not overly expensive in the raw form and therefore are not the largest contribution to ultimate cost and do not in themselves stand in the way of commercial developments.

Thermoelectric heat pumps may not prove to be a panacea for those with excess heat or temperature control problems, however, this relatively simple new system may fill in some of the gaps in present heat transfer problems.

British Columbia Chapter made

67th Annual

a memorable

Opened by retiring-President Daniel D. Wile, the 67th Annual Meeting of ASHRAE was officially welcomed by Regional Director (X) Charles L. Hall.

As provided by ASHRAE's merger-implementing Plan for Reorganization, new officers took charge in the fourth step of succession at the Vancouver Meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, June 13-15, 1960. Walter A. Grant is now President. R. H. Tull is First Vice President. John Everetts, Jr. is Second Vice President. Elected Treasurer by member ballots was John E. Dube. Similarly voted upon as new Directors were W. J. Collins, Jr. (Region VIII), J. F. Naylor, Jr. (Region VII) and T. J. White (Region X). New Directors-at-Large are W. S. Harris, W. L. McGrath, J. W. May, Axel Marin, G. B. Rottman and V. D. Wissmiller.

At the 67th Annual Meeting various honors and awards in recognition of distinguished service to the Society were made. These included the F. Paul Anderson Award to P. B. Gordon, certificates of appreciation to retiring-President Wile and to those Directors yielding office at this time and elevated status to a group of Fellow and Life Members (the latter are listed on page 56 of this issue).

Other awards included: ASHRAE Klixon Award for 1959 to John F. Harris and C. B. Sonnino for their "New Insulating Media for Hermetic Motors Require New Tests," which appeared in the March 1959 issue of the ASHRAE JOURNAL. This award is for the best JOURNAL-published paper relating to electric motors or controls. ASHRAE Wolverine Award to P. H. Ziel and J. S. Blossom for "Pressurizing High Temperature Water Systems," as published in the November 1959 issue of the ASH-

Chairman of the First Technical Session and retiring-Chairman of the ASHRAE Program Committee was Si J. Williams, here shown with speakers R. A. English, R. H. Merrick, C. M. Humphreys, who presented the Ozisik-Schutrum paper and B. E. Eakin.

the ASHRAE

Meeting

occasion

Harold P. Harle was Chairman of the Domestic Refrigerator Engineering Symposium where Mrs. Virginia Habeeb was keynoter and E. V. Sutin, G. H. Pope, D. C. King and A. E. Couch discussed various factors influencing the engineering-design of refrigerators

RAE JOURNAL. This award is for the best paper published in the JOURNAL within an annual interval. ASHRAE Willis C. Carrier Award to Aaron L. Brody, senior author of the paper, "Use of Activated Charcoal to Decrease Odor and Odor Transfer in Domestic Refrigerators," presented at the Dallas Semiannual Meeting in February 1960. (ASHRAE JOURNAL, April 1960). Awarded for the best paper presented at a National Meeting by an Associate Member under 30. ASHRAE Homer Addams Award for 1959, presented to a graduate student on an ASHRAE research project, went to Frank D. Farrington. The committee selects the school and the school recommends the student.

The Vancouver Meeting was a truly notable one both for the relatively large attendance at a comparatively remote location and for the unusually active participation in attendance at individual sessions and in the discussions there. There were 593 registrations of members and guests.

AT THE TECHNICAL SESSIONS

Opening the First Technical Session, B. E. Eakin and R. T. Ellington of the Institute of Gas Technology described how air conditioning by liquid-desiccant-drying and adiabatic partial resaturation of the circulated air can control relative humidity as well as temperature and how dust and odors are removed in the dual washing the air receives. Further, an open cycle system can be adapted easily to year-round operation providing summer cooling and winter space heating, with complete humidity control. However, there are few regions with climates sufficiently dry to permit cooling of the air directly by partial resaturation. Dehumidification of air prior to the evaporative cooling has shown some disadvantages from the standpoint of complete gas-firing—when moisture is removed from air the heat liberated raises the temperature of the dried air to an extent whereby mechanical refrigeration is often required for effective cycle operation.

An experimental open cycle unit constructed in 1948 which included a water-cooled dehumidifier and employed lithium chloride as the sorbent was described. This equipment utilized an absorber heat exchanger fabricated of automobile radiator core sections with horizontal passes for the cooling water. Results of studies indicated that the open cycle with a water cooled dehumidifier had advantages over compression-refrigeration air conditioning cycles, if a sorbent as effective as, but less corrosive than, lithium chloride could be found.

Calculated results of thermodynamic analyses of liquid-sorbent open air-conditioning cycles and experimental results obtained by use of a laboratory pilot unit utilizing one these cycles disclosed that: An efficient modified open air conditioning cycle can be based on the use of triethylene glycol as the sorbent liquid. Sufficient experimental data are now available for the engineering design of a unit based on this modified open cycle. Finally, a more efficient dehumidifier contactor design should be developed to make such a unit sufficiently compact for the domestic market. It was brought out that the contactor utilized in the pilot unit was constructed of flat parallel fin, which represents only a first effort. Highly efficient packing materials and contacting techniques are available industrially which could be applied to this operation.

R. H. Merrick and R. A. English of the Bryant Manufacturing Company reported upon an air-cooled absorption refrigeration cycle with application to air conditioning equipment, manufactured in 3 and 4½ ton sizes, comprising an outdoor, air-cooled water chilling section which

circulates chilled water to furnace, duct or fan coils serving the conditioned space. Design objectives called for an air-cooled hermetic absorption cycle. A new cycle was considered necessary, since cycles now in use incorporate these limitations—Cycles evolving from lithium bromide water combinations require low absorber temperatures which can not be maintained practically by air cooling. Cycles employing halogenated hydrocarbon refrigerants are not suitable because air cooling is not practical, because of poor chemical stability and compatibility with ordinary materials of construction, or because of high solution heat exchange and pumping requirements. The Platen-Munters ammonia-water-hydrogen cycle has poor heat transfer rates and geometric limitations. The conventional ammonia-water cycle has thus far not been hermetic owing to pump shaft seal problems and has not been fully explored thermodynamically.

Studies pointed to a potential in an air-cooled ammonia-water combination if a hermetic circulation means were developed and performance improving heat exchange relationships introduced. In the unit investigated by the authors the solution return trap and the solution cooled rectifier piped in parallel with the heat exchanger answered these conditions.

It was found that actual air conditioner performance will vary from calculated cycle performance according to the magnitude of such losses a trap, flue and jacket and cooling side motor energies. Cycle performance with a pump replacing the solution return trap can be readily calculated once a pump performance is assumed along with relative costs of heat and electrical energy, according to the authors. However, this is a difficult high-head, low-flow pumping job involving a saturated liquid with approximately the viscosity of water. Pump performance assumptions could be extremely hypothetical, it was brought out.

Second Technical Session had as its Chairman R. A. Line (incoming-Chairman of the Program Committee) here shown with scheduled speakers Merl Baker, B. W. Hatten and T. C. Min

In a dual solution system of the open absorption type, air to be conditioned is brought into direct contact with a hygroscopic solution, explained F. H. Hibberd, Air Conditioning Development Company.* The significant difference between the dual solution system and other open absorption systems is that in the former the hygroscopic solution is cooled continuously so that it simultaneously cools and dehumidifies the air. Both strength and temperature of the solution are controllable readily within limits; therefore, the temperature and moisture content of the conditioned air are controllable individually. However, this asset is achieved at the cost of a relatively complex cycle and apparatus. Lithium chloride was used in this experimental equipment.

Low operating cost and independent control of humidity and temperature within limits are cited as chief advantages. The dual solution system also offers unusual control of conditioned air humidity, efficiency reduced vibration and noise, low electrical load, absence of pressure, combined heating and cooling if required, moderate standards of tightness and germicidal treatment of air if desired. The outstanding drawback, according to speaker Hibberd, is that many parts are required, which means added first cost and added space requirements. Further, there are transportation and similar applications for which it is unsuited and it lacks the ability to produce extremely low humidities needed for some processes.

Slat-type sun screens positioned between two sheets of glass as a means of controlling solar heat gains were the basis of a research program conducted by N. Ozisik and L. F. Schutrum at the ASHRAE Research Laboratory in Cleveland—and reported at the meeting by C. M. Humphreys. The shading devices tested consisted of commercial sun screens positioned between two sheets of common window glass (Normal Transmittance about 0.87) in the following manner: (a) the sun screen in direct contact with both sheets of glass; (b) in direct contact with both sheets of glass and having the sun screens embedded in plastics; (c) with a small space between the sun screen and the two glasses. These shading devices were available commercially; a fourth type, venetian blind slats between two sheets of glass, was constructed at the Laboratory.

Results of this study indicated that instantaneous heat gains through slat-type between-glass shading devices have been predicted with engineering accuracy from the incident solar radiation, the outdoor air temperature, and the K and U values. Use of these shading devices resulted in a reduction of in-

*See pp. 42-46, ASHRAE JOURNAL, July 1960.

Changing the Guard. Incoming-President Walter A. Grant presents retiring-President Daniel D. Wile with a Certificate of Appreciation.

Also at the Welcome Luncheon; stood Second Vice President John Everetts, Jr. with Presidents Grant and Wile and First Vice President R. H. Tull.

A. C. Martin, General Chairman of the Arrangements Committee of the Vancouver Chapter extended his greeting.

stantaneous heat gains as compared with a window of single glass. For a west-oriented window, the design instantaneous heat gain from 12 noon to 5 p.m., using a slat-type between-glass shading device constructed with ordinary window glass would be about 35 to 60% of the gain through a window of single regular plate glass. These percentages also hold for the maximum instantaneous heat gains.

A fundamental tool for designing any fluid system, the friction chart is almost indispensable in high-temperature systems because of the wide range of water temperature and density, declared T. C. Min, Auburn University and P. J. Potter, formerly of Alabama Polytechnic Institute. Calculation of friction losses for a wide range of temperature, velocity and pipe sizes is tedious and troublesome, thus there is a real need for a friction chart.

To be of real value, a chart must have distinct features which aid functionally in problem analysis, the authors stressed. They proposed a friction chart which fulfills these requirements—Applicable for overall system design. Covers the wide temperature range (200-500 F) encountered in practice in high-temperature water systems. Applicable for a wide range of sizes and water velocities, and independent of pipe wall thickness. Based upon currently accepted friction data. Consistent with indisputable engineering principles. Styled for convenient use and simplicity without sacrificing engineering accuracy.

V. G. Foris and B. W. Hatten of Westinghouse Electric Corp. defined the Scotch yoke as a simple mechanism for converting rotational to reciprocating motion, whose chief characteristics are that it provides simple harmonic motion with respect to crank rotation, and is capable of accommodating relatively large variations in perpendicularity between the cylinder bore and the crankshaft. Of primary importance in this study was the application of the yoke to small compressors used in household refrigerators and freezers. Specifically, the objective was to reduce the magnitude of the restraining loads

Opened by Chairman J. H. Rainwater, the Commercial Refrigeration Symposium was allied with the problems of food stores and speakers were D. E. Friedman, T. L. Tyler and J. A. Biggers

on the piston and other parts of the Scotch yoke, and thus minimize noise, wear and power consumption. While this analysis is relatively straightforward, numerous combinations of variables and the complexities introduced by friction characteristics made extensive calculations necessary, which involve a high probability of error, in addition to being tedious. Consequently, use was made of a digital type electronic computer to accomplish a thorough investigation with accuracy and in a short time. The computer proved to be quite practical.

As an outcome of these studies, it was reported that friction, especially occurring in the slider, is the most critical factor influencing reaction forces and every practical means of improving lubrication and surface conditions should be employed. Offsetting the cylinder with respect to the crankshaft provides a means of equalizing peak loads. The need for the cylinder offset is greater with increased stroke and speed. Offset increases the hazard of binding parts, but this can occur only at high friction values exceeding those acceptable in a compressor. Other factors, such as piston engagement and diameter influence the reaction loads in a predictable manner, but no critical changes occurred with small variations from a typical design. Crank pin friction and follower inertia have negligible effect on reaction loads except at rather small follower loads. The cylinder offset does not affect motor torque significantly. Author Hatten, who presented the paper, suggested that results of noise and life tests should continually be analyzed in the light of these data to observe correlation between the load peaks and the noise and wear patterns.

According to J. M. Elliott, University of Kentucky and Merl Baker, Kentucky Research Foundation, there is a deficiency of reliable design data on which to base an estimate of basement heat losses. These data are needed in the determination of a design to avoid condensation on the basement walls and floors. In presenting the paper, Dr. Baker pointed out that the magnitude of the heat loss depends on the type of construction, the thermal conductivity of the soil and the climatic conditions. The maximum, or design loss will occur when steady state conditions are approached; that is, when the outdoor temperature drops and remains low for a considerable length of time.

Investigations proved that the electrical geometrical analogue using the conductive sheet method is an excellent method for evaluating basement heat losses. The paper used for the models was inexpensive and easily cut to any desired shape. The isopotential lines which constitute the measured field were recorded directly on the conductive sheets. The points located in plotting the constant voltage lines could be checked within 0.01 in. with the tracing probe. The variation of electrical resistivity with humidity changes introduced an error of $\pm 3\%$ in the calculated heat loss values; however, this error could be reduced to less than 1% in cases where the refinements are justified by performing the tests in a controlled atmosphere. The maximum electrical resistance ratio obtainable by perforating the sheet was about 5:1. This excludes the use of the conductive sheet method with a single thickness for determining the losses through well insulated walls and floors. The shape factors presented were independent of the thermal conductivity of the soil but are dependent on the ratio of the thermal conductivities of the basement walls and soil. In conclusion, it was stated that interpolation between the values given may be performed with a reasonable degree of accuracy, but extrapolation will produce uncertain results.

Reporting upon a study of cooling rates of apples under various commercial storage conditions, D. V. Fisher of the Canada Department of Agriculture indicated that in containers with good surface exposure quite rapid cooling took place (66 to 33 F in 80 hr).* This was confirmed in actual warehouse tests where various containers were stacked 6 high at different spacings in a commercial cold storage plant. Cooling tests in another storage using fruit loaded on pallets stacked solidly and spaced on pallets (lock stacks) demonstrated that spacing of containers reduced cooling time by 50%, and lowered final holding temperature by about 1F. Cartons with vents of various sizes did not differ significantly from wood boxes in rate of cooling. This was explained as blockage of ventilation within containers by the presence of cells, trays and fruit.

*See pp. 53-56, ASHRAE JOURNAL, July 1960.

Contending that absorption refrigeration and air conditioning systems potentially offer several advantages as compared to vapor-compression type systems, L. F. Albright, T. C. Doody, P. C. Buclez and C. R. Pluche of Purdue University stressed that although the initial cost of the absorption systems is at present higher, their operating expenses are often appreciably lower. They affirmed that even better advantages for the absorption systems would be possible if improved chemical combinations were available as the specified solvent and refrigerant.

Purpose of this study was to determine systematically the solubility characteristics of three fluorocarbon refrigerants in polar organic solvents, which contain an oxygen atom, over a wide range of temperatures and pressures. It was contended that the results obtained help evaluate the factors of importance in the solubility phenomenon and, additionally, aid in directing future research for finding better chemical combinations for absorption refrigeration. These results indicated that esters, carbonyl compounds, and especially ethers are good solvents for refrigerants containing a hydrogen atom such as Refrigerants 21 or 22.

Based on only solubility characteristics, the dimethyl ether of tetraethylene glycol and Refrigerant 21 or 22 is the best combination of chemicals investigated for an absorption refrigeration cycle. Refrigerants such as Refrigerant 11 which contain no hydrogen atom are not suitable. The hydrogen bond theory explains solubility deviations of the systems studied as compared to ideal solutions.

Although the phosphorus pentoxide absorption procedure is the method generally recommended throughout the industry for determining traces of water in refined fluorocarbons (refrigerants or aerosol propellants), related W. S. Engle, who presented a paper by J. D. Morton and L. K. Fuchs, Union Carbide Chemicals Company, this method is extremely time consuming for routine analyses since a single determination requires from 3 to 16 hr depending upon the flow rates used in different laboratories. Other methods, utilizing the Karl Fischer reagent, lack the required accuracy and sensitivity for determining water in the 1 to 20 ppm range and are difficult to apply to materials which are gases under ordinary conditions. Infrared spectrophotometric methods and the use of the electrolytic water analyzer both have certain disadvantages when applied to the routine analysis of a wide variety of samples.

Here reported upon was an investigation whereby the sensitivity of the Karl Fischer method for water was increased approximately 100 fold by a simple dilution of the reagent with methanol neutralized with Karl Fischer reagent. A cooled, pressurized titration apparatus was designed which allowed the samples to be analyzed from the liquid phase and provided maximum protection from atmospheric contamination during the sample addition and titration procedure. The method can be performed rapidly in any analytical laboratory and is applicable to Refrigerants 11, 22, 12, 113 and 114, and many other compounds which are liquids at 0 C and 60 psi. The average standard deviation of the procedure is 0.6 ppm and the accuracy is ± 1 ppm water in the 1.0 to 20 ppm range. Economical, all of the components required to fabricate this apparatus were purchased at a total cost of approximately $600. Results showed that this method of analysis, after preliminary standardization and preparation of equipment, can be performed in a routine analytical laboratory in approximately 15 minutes per determination. The authors concluded that, "On the basis of the results obtained, the procedure is recommended for routine analysis of fluorocarbons for water. It is believed that the use of the method is advantageous from the standpoint of accuracy, precision, ease of performance and analytical time saved."

As first of a series of reports on a broad study of the factors influencing the stability of fluorocarbon refrigerants and refrigerating oil mixtures, W. O. Walker and S. Rosen of the University of Miami and S. L. Levy of Allied Chemical Corporation undertook a study

Chairman G. F. Carlson presided at the Third Technical Session where refrigerants and oils were the topic. He is here shown with W. S. Engle who presented the Morton-Fuchs paper, Walter O. Walker and Edward A. Beacham

Dean Walker presented a study of the stability of mixtures of refrigerants and oils

At the speakers' table, when Chairman R. S. Buchanan presided at the Fourth Technical Session, were Second Vice President John Everetts, Jr., George V. Downing, Jr., W. V. Huck and L. A. Staebler

A comparative study of manufacturing costs in the thermoelectric field was the topic of speaker Staebler

of Refrigerants 11, 12, 22, 12 and 22, 113, 114, 114A, 500 and three refrigerating oils with regard to the effects of water, air, temperature, time and various metal combinations on their mixtures. The sealed glass tube method was used throughout.

Conclusions relating to the influence of water indicated that the per cent occurrence of wall deposit is slightly less in tubes containing liquid water; per cent occurrence of corrosion is considerably greater in tubes containing liquid water; wherever there was color development, both the rate and degree were, with some exceptions, less in tubes containing liquid water. All oils behaved somewhat alike except the water white oil which showed slightly lower per cent occurrence of wall deposit, copper corrosion and plating; conclusions relative to color development were complicated by the fact that the initial color of the refrigerant-oil mixtures was different, but there was some difference between the water white and the pale yellow oils with respect to color development. Temperature findings showed that the per cent occurrence was greater in the presence of air; and air greatly increased the rate and generally the degree of color development. Per cent occurrence of wall deposit was greater in the presence of metals, regardless of combinations; per cent occurrence of corrosion of copper and steel, although not equivalent, was affected slightly by the metal combinations; per cent occurrence of aluminum corrosion was reduced in the presence of steel; per cent occurrence of corrosion of brass was of the same order as steel; per cent occurrence of copper plating was alike in all cases except with the brass-steel combination, in which case there was none; in general, the copper-aluminum combination produced a greater rate and degree of color development than the other metal combinations; the rate and degree of color development in the pale yellow oils was greatest in the non metal tubes with air.

W. O. Krause, A. B. Guise and E. A. Beacham, in a paper presented by the latter (all are of Ansul Chemical Company) reminded that the primary function of driers in the refrigerating system is to remove moisture from the refrigerant, thus preventing expansion valve or capillary tube freeze-up and minimizing the formation of harmful corrosion products. Despite the accepted importance of driers and the extensive study of their absolute water capacity, little work has been done to investigate the factors affecting the time required to reduce the moisture level of a system. The drying process is not instantaneous and knowledge of how a given system may be expected to progress from a wet to a dry state is necessary to evaluate drier application. Effects of some of the basic refrigerating system variables on the progress of the drying action – rate of flow of the refrigerant; internal area of the refrigerating system; and size of the drier or depth of desiccant bed – were covered in this study.

Action of a drier in a given refrigerating system requires a considerable period of time to bring the moisture level of the refrigerant to a state of equilibrium with the drier, results showed, and actual time required will vary with the rate of refrigerant flow, internal area of system and size of drier. In general, the time required to dry systems with low rates of refrigerant flow will take longer than those with high flow rates. A larger drier will dry a system more rapidly than a smaller drier. With the same basic components remote systems will take longer to dry than packaged units because of greater internal surface area.

That part of the refrigerating system which is closest to the outlet end of the drier will be reduced to a low moisture level almost as soon as the drying process begins, therefore it was recommended that the drier be installed as close upstream to the expansion valve or capillary tube as possible. Thus, one of the sensitive parts of the system as far as moisture is concerned will be in the dry zone well before

the entire system is dry. This will assure immediate and continuing protection against freeze-ups, regardless of drying time required, as long as drier capacity is adequate. A large drier will reduce the moisture content to a lower degree and in a shorter period of time than a small drier. Accordingly, the possibility of freeze-ups and formation of corrosion products due to moisture are minimized. It was stressed that the data presented indicated what to expect when the care taken in equipment dehydration before start-up and the nature of the installation itself are considered.

AS TO THERMOELECTRICS

"Because the usefulness of thermoelectric materials, such as bismuth telluride and lead telluride is a result of their unusual electrical and thermal properties, rapid and precise control procedures are essential to insure the quality of material being produced." Thus stated G. V. Downing, Jr., of Merck, Sharp and Dohme Research Laboratories who discussed production control testing of thermoelectric materials. Normally, he said, the material is prepared in cylindrical ingots of varying length and diameter so that apparatus must be flexible. Resistivity profile and the Seebeck coefficient on every ingot are measured; thermal conductivity is measured only occasionally. The methods used for measurement are all cited as being suitable for use in routine quality control of thermoelectric materials. Accuracy of each measurement is of the order of $\pm 3\%$ and the precision is $\pm 2\%$ in the case of thermal conductivity and probably somewhat better for resistivity and Seebeck coefficient.

There are many similarities between using thermoelectricity to pump heat and to generate electricity, according to W. V. Huck, Minnesota Mining and Manufacturing Company. The same general types of materials are used, the same physical parameters are of interest, and the same physical theory encompasses both. The major difference is in goal — a thermoelectric generator is a conversion device that converts thermal energy directly into electrical energy, while a thermoelectric heat pump is an energy transfer device, using electrical energy to transport thermal energy from one point to another.

Although several American companies have built heat pump devices they are still not economically feasible. It was predicted that before long small refrigerators and dehumidifiers will appear on the market, but at the present time it appears that the field will be limited to smaller industrial applications. Present material and assembly costs place this new system out of many markets, in most cases

Downunderer William L. Cooke brought greetings from the New Zealand Branch of the Institution of Heating and Ventilating Engineers and is here shown with speaker W. V. Huck following the thermoelectric session.

assembly and handling costs outweigh materials costs. Improved materials will mean simpler and cheaper assemblies. Adding to the high costs is the fact that laboratory rather than production methods have been used to date and only small quantities are being produced. It is possible that automated production could break this economic barrier. Presently used semi-conducting materials are not overly expensive in the raw form and therefore are not the largest contribution to ultimate cost and do not in themselves stand in the way of commercial developments. Author Huck observed that the thermoelectric heat pump might fill in some of the gaps in present heat transfer problems.

Comparing manufacturing costs of thermoelectric and mechanical refrigerating systems,* D. W. Scofield, P. F. Taylor and L. A. Staebler of Philco Corporation cited these advantages of thermoelectricity as applied to heat pumping over the mechanical system: elimination of moving parts, except possibly for a small fan to assist the heat transfer processes; reduction in noise; substitution of simple electrical wiring for the hermetically sealed system required to contain the refrigerant; modulation of heat pumping capacity accomplished readily through a corresponding modulation of the operating current; reverse cycling easily achieved by current reversal; and ease with which thermoelectric system can be used

*See pp. 37-41, ASHRAE JOURNAL, July 1960.

for small capacity cooling applications. Despite these advantages, thermoelectric heat pumping must be competitive in manufacturing cost in order to replace the conventional mechanical system.

In order to compare the manufacturing costs of thermoelectric heat pumps with those of conventional mechanical systems for various design capacities, a relationship was developed between cost and heat pumping capacity for a thermoelectric system. Co-author Staebler, who presented the paper, explained that the cost of basic semiconductor materials used in establishing this relationship was that which present manufacturers consider to be attainable within the next few years.

The authors summarized that despite competition of the low cost mechanical refrigerating system, thermoelectricity may have applications in the near future for devices of capacities up to 200 Btu per hr and within a few years thermoelectric refrigerators of up to 4 cu ft may be available. "Although it does not appear that thermoelectricity will in the foreseeable future completely replace or obsolete the mechanical system there are good reasons to expect that continued research will eventually provide a combination of improved thermoelectric materials, simplified manufacturing techniques and low cost power supplies which will make thermoelectric refrigeration economically competitive with mechanical refrigeration for the larger major appliances."

AT THE SYMPOSIUMS

The Domestic Refrigerator Engineering Symposium was related to "Human Engineering and Its Demands on Refrigerator Design." As explained by Presiding Chairman Harold P. Harle, the refrigerator and design engineer works from specifications prepared by other people, rather than design appliances himself. These specifications are influenced by a number of factors. Virginia Habeeb was the Symposium Keynoter.

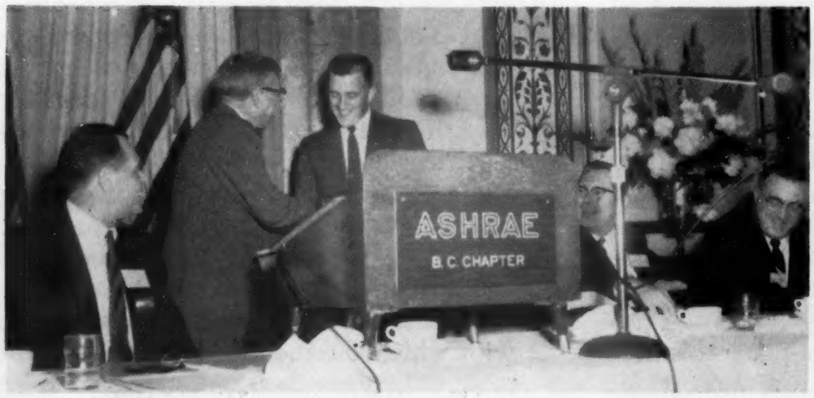
Human engineering is one of these factors to be considered, since the product must be made simple enough to be of use to the average consumer. Specifications for physical arrangement and styling are usually submitted by the industrial engineer.

Codes and standards constitute another group of specifications of which the engineer must be mindful. Possibly the most important specifications for the engineer to meet are those set by the customer. Finally, the engineer must consider independent organizations which conduct various tests on appliances and publish their evaluations in bulletins which are sold to the public. Their test methods and facilities and criteria for evaluation were discussed.

Among the Symposium speakers was G. H. Pope of Underwriters' Laboratories Inc. who discussed U.L. requirements as they apply to approval of refrigerators and freezers. Included in his presentation were descriptions of how specifications are established and how tests are conducted, together with U.L. evaluations of various materials. Speaker Pope offered suggestions for improvements in design and better communication between the Laboratory and manufacturers.

Keynoter Virginia Thabet Habeeb, Home Equipment Editor, American Home Magazine, discussed human engineering and its demands on refrigerator design. Representing the Canadian Standards Association, D. C. King, engineer in charge of the light industrial section, presented C.S.A. requirements. Completing the panel were E. V. Sutin, Walter Dorwin Teague Associates, describing styling

Presentation of the Homer Addams Award for 1959 was made to Frank D. Farrington by President Wile as Walter A. Grant, R. H. Tull and F. Y. Carter beamed. (Right) Executive Secretary R. C. Cross formally announced the results of member balloting at the Second Technical Session



As President W. A. Grant closed a memorable meeting and welcomed those in attendance to be in Chicago for the Semiannual Meeting February 13-15, 1961

and features for household refrigerators, and A. E. Couch of the Puget Sound Power and Light Co. who offered his viewpoints on how the utility looks at refrigerator design.

J. H. Rainwater was Presiding Chairman of the Commercial Refrigeration Symposium, which was devoted to an inquiry of "The Effect of Air Conditioning in Food Stores on the Operation of Open Display Equipment." Chairman Rainwater sees the need for more coordination between air conditioning engineers and refrigerating engineers in designing modern day supermarkets. There is an increasing number of open display refrigerators installed in supermarkets and cooling loads are becoming dependent on one another. Thus, air conditioning grilles, which have a direct effect upon the refrigerator operation, must be planned in the beginning with the open case in mind, he maintained.

"An improperly air-conditioned supermarket can greatly hinder the operation of the refrigerated display equipment, resulting in high operating costs and possibly even improper product temperature," asserted T. L. Tyler, Tyler Refrigeration Corp. The location and design of air grilles is of the utmost importance, since drafts must not be allowed to impinge on the refrigerated display area. Reduction of the heat load by display equipment must be considered in designing air conditioning systems; extreme humidity problems can result with an oversized system as the open refrigerators remove mainly sensible heat. It was pointed out that new vertical display open refrigerated equipment concentrates radiant heat removal from nearby areas, for this reason care must be taken to avoid customer discomfort by overcooling these areas.

Effect of various normal temperatures and humidities on refrigeration requirements of an open display refrigerator and effect of the refrigerated equipment on the air conditioning load were covered by Donald E. Friedman, Hussmann Refrigerator Co. The magnitude of these inter effects of air conditioning and open display refrigerators was emphatically brought out.

As his topics, J. A. Biggers of Friedrich Refrigerators Inc. discussed conditions at which condensation occurs in air-conditioned and non air-conditioned stores as related to refrigerated open display equipment; methods of correcting conditions at which condensation occurs in air-conditioned and non air-conditioned stores as related to refrigerated open display equipment; areas where condensation occurs in refrigerated open type display equipment and its effects on the case, product and consumer; and methods of correcting condensation areas in and on refrigerated open type display equipment.

AT THE FORUMS

Maintaining the traditional off-the-record character which has long added to the freedom of discussion at Society Forums, the seven groups which met in Vancouver provided exceptionally good attendance and participation. These were: Cryogenics – V. J. Johnson, National Bureau of Standards; Aluminum Tube Refrigeration Coils – O. J. Nussbaum, Kramer-Trenton Co.; Corrosion with Window Air Conditioners – C. O. Hutchinson, The Glidden Co.; Reducing Power Needs for Hot Water Systems – C. W. Pollock, Crane Co.; Practical Applications of Foam Insulation – V. L. Miller, Pittsburgh Corning Corp.; Economics of Electric Heating vs. Fossil Fuels – L. Bouillon, Bouillon, Griffith, Christofferson & Schairer; and Noise in Ventilating Systems – D. P. Dakos, Koppers Co.

INFORMAL MOMENTS

Social events included the scheduled Welcome Luncheon, where new officers were installed, the Annual Banquet, where honors and awards were announced, the five hour cruise on the Princess Patricia through fiord-like Howe Sound and various sight-seeing trips through neighboring points of interest, all of which followed a get-together party preceding the actual meeting where the British Columbia Chapter was host.

Among those attending the Vancouver Meeting were the following Chapter officers: R. E. Ahlf, President, Evansville; S. F. Gilman, President, Central New York; J. R. Hall, Treasurer, Southern California; R. W. Hole, Second Vice President, British Columbia; W. L. Holladay, President, Southern California; W. H. Miller, Vice President, Wisconsin; D. J. Moore, Treasurer, Puget Sound; H. G. S. Murray, immediate Past President, Montreal; M. J. Phillipson, Treasurer, British Columbia; T. R. Simonson, immediate Past President, Golden Gate; H. R. Skinner, President, Manitoba; L. H. Streb, Secretary, Illinois; D. F. Swanson, President, Minnesota; W. R. Vernon, Treasurer, Northern Alberta; W. F. Wiggins, President, British Columbia; and R. A. Williams, immediate Past President, Northern Alberta.

ASHRAE Members Advanced to Fellow and Life Grades

FELLOWS—

In recognition of unusual distinction in the arts relating to the sciences of heating, refrigeration, air conditioning or ventilation, or to allied arts and sciences, or in the teaching of major courses in said arts and sciences, or of substantial contribution made by reason of invention, research, original work or service as an engineering executive on projects of unusual or important scope, a qualified member in good standing for ten years and over the age of 45 may be honored by elevation to Fellow of the Society.

P. B. Gordon, past-President of the former ASHAE and Vice President of Wolff & Munier, Inc. A three-year term on ASHAE Council which began in 1952 was followed by his election as 2nd Vice President in 1955, 1st Vice President and Chairman of Council in 1957. Past committee activities include: Guide Publications Committee, member (1949-50) and Chairman (1951); TAC on Panel Heating and Cooling, member (1947-48, 1956-57) and Chairman (1949-55); Standards, member (1952-53) and Chairman (1954); Program and Papers, 1952-53; Building, 1953-56; Ways and Means, 1954; ASHAE-ASRE Committee on Cooperation, 1954-55; Long Range Planning, member (1953-54) and Chairman (1955); Chapter Relations, Chairman (1955) and Executive Committee, member (1955, 1958) and Chairman (1956). In 1956 he was also Chairman of the F. Paul Anderson Committee and a member of the Guide Advisory Committee and ASHAE-AIA Committee on Cooperation.

Walter A. Grant, ASHRAE President and Vice President and Director of Engineering of Carrier Corporation. A member of the former ASHAE (1929), ASRE (1942) he was 2nd Vice President and Chairman of the Regions Central Committee in 1958. Committee membership has included: Committee on Research, 1949-54; TAC on Odors (Vice Chairman, 1953), Sensations of Comfort (1949-51), and Air Distribution (Vice Chairman, 1952-54); and the Nominating Committee, 1952-53. During the three-year term on Council which he completed in 1957, he served as a member of the Finance Committee in 1955-56 and as its Chairman in 1957; on the Long-Range Planning Committee, Nuclear Energy Engineering Committee, Program and Papers Committee (Chairman, 1956) and Advisory Committee (Chairman, 1957). In 1959, just prior to the merger, he was elected 1st Vice President. Since the merger, he has served as 3rd, 2nd and 1st Vice President, Vice Chairman and Chairman of the Regions Central Committee, member of the Executive Committee and the Special Steering Committee of the Board of Directors and Chairman of the Technical Coordinating Committee.

John Everetts, Jr., ASHRAE 2nd Vice President and Consulting Engineer with Charles S. Leopold. Elected to ASHAE Council in 1956, he served as Chairman of the Program and Papers Committee in 1957-58 and as a member of the Finance Committee (1958), Long-Range Planning Committee (1956-58), ASHAE-AIA Committee on Cooperation (1957-58) and the F. Paul Anderson Committee (1957). Currently, he is a member of the Finance, Technical Coordinating (past-Chairman), Executive and Advertising Committees and is Vice Chairman of the Regions Central Committee. Elected to the Committee on Research in 1951 for a three-year term, he was re-elected in 1954 and served as Vice Chairman in 1955. TAC membership includes: Weather Data (Chairman, 1953-58), Sorbents (Chairman, 1944-50), Sorption (Vice Chairman, 1952-56), Sensations of Comfort (Vice Chairman, 1952-55), Physiological Research and Human Comfort (Chairman, 1958), Plant and Animal Husbandry (1953-57), Cooling Load (1951-54), Panel Heating and Cooling (1950-55), Cooling Load in Summer Air Conditioning (1938-44), Weather Design (1938-46) and Air Conditioning of Residences (1934-41). He has been Regional Director of Regions I (ASHAE) and III (ASHRAE) and chairman, Publications Committee (ASHRAE).

E. R. Queer, past-President of the former ASHAE, member of the Executive Committee and Director and Professor of Engineering Research, Pennsylvania State University. Beginning a term in ASHAE Council in 1950, he was subsequently elected Treasurer (1954), 2nd Vice President (1956) and 1st Vice President (1957). Since joining ASHAE in 1933, he has been active on numerous committees, among which are: TAC on Navy Studies and Air Sterilization, 1948; Insulation, 1939-49; and Human Calorimetry, 1949-56; Committee on Research, 1948-50; Admission and Advancement, member (1945-47) and Chairman (1947-48); Federal Liaison, 1949; Program and Papers, Chairman (1951-52); and Ways and Means, 1952 and 1954-55. In 1956 he was Chairman of the Regions Central Committee and the Honors and Awards Committee, and in 1957 he served as Chairman of the F. Paul Anderson Committee. Prior to the merger he served a four-year term on the ASHAE-ASRE Committee on Cooperation.

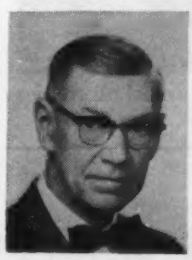
John W. James, past-President of the former ASHAE and Vice President of Research, McDonnell & Miller, Inc. Elected a junior member in 1933, he advanced to full membership in 1937. In 1950 he began a three-year term on Council which was followed by his election as Treasurer in 1953, 2nd Vice President in 1954 and 1st Vice President in 1955. From 1935-43 he was Technical Secretary. Activities in ASHAE have included membership on the Program and Papers Committee (Chairman, 1949), Finance Committee (Chairman, 1954), Executive Committee (Chairman, 1955), F. Paul Anderson Committee (Chairman, 1955), Long-Range Planning Committee, Public Relations Committee, Committee on Research (Vice Chairman, 1949) and TACs on Panel Heating and Cooling, Hot Water and Steam Heating and Physiological Research. He has also worked on the Long-Range Research Program, Publication, Constitution and By-Laws, Nominating, Publication Policy and Guide Committees. Associate Editor of the 1951 edition of the "Handbook of Oil Burning," he served as Technical Editor of the Guide from 1936-43 and is co-author of the textbook "Heating and Air Conditioning."

M. K. Fahnestock, 15th recipient of the F. Paul Anderson Medal and Research Professor of Mechanical Engineering and Chairman, Physical Environment Unit, University of Illinois. As a result of his many research projects, he has prepared or co-authored more than 20 papers in Society publications as well as numerous papers for other journals. A long-time member of the former ASHAE (he was elected a Junior in 1927), he served a three-year term on Council from 1952-54. Other positions he has held include: Committee on Research, 1938-43 and 1947-50 (Executive Committee, 1940-43); Public Relations Committee, 1954; and TACs on Refrigeration in Relation to Air Treatment (Chairman, 1935-36), Direct and Indirect Radiation with Gravity Air Circulation (Chairman, 1935-36), Effect of Entering Temperature and Velocity on Temperature and Distribution of Air within an Enclosure (1936), Radiation with Gravity Circulation (Chairman, 1937-43) Air Distribution and Air Friction (1938-39 and 1943), Summer Air Conditioning for Residences (Chairman, 1937-43); Instruments (1939-40), Sensations of Comfort (1945-47), and Physiological Research (Chairman, 1950-56).

P. J. Marschall, member of ASHRAE Board of Directors and Vice President in Charge of Engineering, Abbott Laboratories. Formerly Director of Region II, he was elected to ASHAE Council in 1957 and has, since the merger, served on the Finance, Meetings Arrangements, Guide and Data Book, General and Administrative Coordinating, Building (Chairman) and Emblem and Insignia Committees and as Coordinator for Regional Affairs in Region VI and Consultant for Region V. ASHAE Committees of which he has been a member include the Guide Publication Committee (1949-51), Publication Committee (Chairman, 1952-53), Joint Committee on Standards for Comfort Air Conditioning (Member-at-Large, 1955-58), and TACs on Relation of Body Changes to Air Changes (1937) and Industrial Environment (1953-58). Illinois Chapter elected Mr. Marschall President in 1950, after he had served as Treasurer and Vice President. At the 63rd Annual Meeting he was General Chairman, Committee on Arrangements.

William T. Miller, Professor of Heating and Ventilating at Purdue University since 1939 and long-time researcher in heating, durability of insulation and heat transfer. Professor Miller's career began with his graduation from Purdue University in 1916 with a Bachelor of Science degree in mechanical engineering. After working as General Superintendent of Lafayette Box, Board and Paper Company and Chief Engineer of Fort Wayne Corrugated Paper Company, he returned to Purdue as Associate Professor of Heating and Ventilating in 1928. A member of the former ASHAE since 1938, he was one of the charter members of Indiana Chapter, serving on the Board of Governors and being elected to honorary membership in 1945. In 1948 he was presented with the charter of Purdue University Student Chapter, for which he is largely responsible. An annual "Bill Miller Night" is held by Indiana Chapter in his honor.

Richard D. Madison, ASHRAE Life Member and Consulting Engineer with Buffalo Forge Company, is perhaps best known as the editor of "Fan Engineering", having made the first revision to this handbook in 1925, with subsequent revisions in 1933, 1938 and 1948. He has contributed a number of papers resulting from his work on fan design; his paper on the subject of elbow loss is still a standard reference. An ASHAE member since 1926, he has served on the Research Committee, Publications Committee and TACs on Air Distribution, Sound and Vibration and Physiological Research. He has been a member of the joint ASHRAE-NAFM Sound Test Code Committee and a representative of these two societies on ASA Committee Z24, Sound and Vibration.



(Continued on page 58)

Edwin F. Snyder, Manager, Product Application Engineering, Minneapolis-Honeywell Regulator Company. An alumnus of the University of Michigan, he joined the former ASHRAE in 1938. His local affiliation is with Minnesota Chapter, of which he has served as Secretary (1948-50), Vice President (1950-51) and President (1951-52). National activities include membership on several TACS, including: Radiant Panel Heating and Cooling (1958), Sensations of Comfort (Vice Chairman, 1953), Air Cleaning (Vice Chairman, 1953; Chairman, 1954-58) and Physiological Research (1955-58). In 1951 he was a member of the Chapter Delegates Committee, and from 1953-57 served on the Committee on Research, of which he was Vice Chairman in 1957 and Chairman in 1958.

Axel B. Algren, Professor and Head, Div of Heating, Ventilating, Air Conditioning and Refrigeration, University of Minnesota. He has served the Society most prominently in the research and publications areas, and completed a three-year term as a member of Council in January 1959. For several years he conducted a cooperative research project with the Society on Air Filtration. Previous projects were conducted with the cooperation of the Department of the Army and the U. S. Public Health Service. TACs on which he has served include: Heat Transmission (1930-33), Glass (1947), Panel Heating and Cooling (1947-57), Heat Flow Through Glass (1948-51), Air Cleaning (Chairman, 1951-55; Vice Chairman, 1956-57) and Plant and Animal Husbandry (member, 1952-57; Vice Chairman, 1955). Director of Region III in 1957, he has been a member of the Standards Committee, Membership Committee, Guide Publications Committee (member, 1948-49; Chairman, 1950) and Committe on Research (member, 1948-53; Executive Committee, 1949-51).

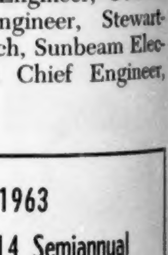
Linn Helander, Professor and Head of the Department of Mechanical Engineering of Kansas State College from 1935 until his retirement from administrative duties in 1957, has since then continued his work in education and research. His teaching career began in 1931 with an appointment as Assistant Professor of Mechanical Engineering at the University of Pittsburgh. He left there upon his appointment to Kansas State College in 1935. A member of the former ASHAE since 1948, he has spoken at several Society meetings and is the author of numerous articles which have been published in technical and scientific journals. Activities in the Society have included the Chairmanships of the TACs on Air Distribution and Roof Ventilation. A Fellow of the American Society of Mechanical Engineers, he served a term as ASME Region VIII Regional Vice President.

Herbert B. Nottage, Research Specialist, Engineering Research Laboratory, Lockheed Aircraft Corporation, and lecturer in engineering at the University of California. Active in research for the former ASHAE, he was Research Associate at the Society's Laboratory from 1945-52 and has served on several TACs, including Cooling Towers, Evaporative Condensers and Spray Ponds (member, 1940-42; Chairman, 1943); Cooling Loads, Thermal Circuits; and Air Distribution. He was a member of the Nominating Committee in 1956 and first alternate in 1957. A contributor to the ASHAE Guide, he has also had several papers published in ASHAE Transactions. Affiliated with Southern California Chapter, he served a one-year term on the Board of Governors and as Chairman of the Codes and Standards Committee. In 1959 he was a consultant to the Research and Technical Committee.

LIFE MEMBERS—

In recognition of distinguished service to the Society and to the industry, a qualified member in good standing for thirty years and over the age of 65 is honored by the grade of Life Member, carrying all rights and privileges of former membership and exemption from further dues.

R. W. Ayres, former member of ASRE Council and retired Engineering Consultant of the St. Paul Div of Whirlpool Corporation. Identified with the refrigeration industry since 1919, he has served on several ASRE committees, among them the Domestic Refrigerator Engineering Conference Committee, of which he was Chairman in 1953. He was Director of Region X for the term ending June, 1956. Prior to joining Whirlpool in 1947, he had been, since his graduation from Yale University in 1917, an engineer with Yale & Towne Manufacturing Company; Chief Engineer, Savage Arms Refrigerating Div; Staff Engineer, General Electric Refrigeration Div; Chief Engineer, Stewart-Warner Corporation; Director of Research, Sunbeam Electric & Manufacturing Company; and Chief Engineer, Coolerator Corporation.



ASHRAE
NATIONAL MEETINGS AHEAD

1961	1962	1963
Feb. 13-16 Semiannual Chicago, Ill.	Jan. 28-Feb. 1 Semiannual St. Louis, Mo.	Feb. 11-14 Semiannual New York, N. Y.
June 26-28 Annual Denver, Colo.	June 25-27 Annual Miami, Fla.	

Steel beam for the seventh story of the tower of the new United Engineering Center is lowered into position. The completed building will be a slim tower of glass, stainless steel and limestone rising from a broad two-story base of glass and stone. It will be near the United Nations Plaza in New York.

"...contribution for the future..."

At the cornerstone laying ceremony of the United Engineering Center, June 16, Mayor Robert F. Wagner and former U. S. President and engineer, Herbert Hoover, helped set the cornerstone for the $12,000,000 building. In his "A Message for Posterity" Mr. Hoover spoke of the emergence of engineering from the status of a trade to that of a great profession and said: "With the training required for an engineer a great contribution for the future has come to the world. The very nature of training for our profession demands intellectual integrity and minds to whom truth has become an instinct. The leaven of this sort of mind will contribute to continuing progress in the free world."

The eighteen story building scheduled for completion next summer will include facilities for office space, meeting rooms for 400 persons, plus smaller conference rooms. The Engineering Societies Library and Engineering Index will have reading facilities for 74 persons at a time and a capacity of 225,000 volumes, one of the largest engineering reference libraries in the world.

For your convenience a contribution pledge form is incorporated within this page. Mail to ASHRAE, 62 Worth Street, New York 13, N. Y.

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How higher

Cooling coil differentials

effect system economies

B. P. MORABITO
Member ASHRAE

Designing for higher chilled water temperature rises and lower water quantities may result in more costly coils and perhaps lead to higher system water pressure drops. However, these cost disadvantages can be more than offset by savings in first cost and operating costs in other parts of the system.

The first place to realize these savings is in the selection of the refrigeration plant. The reduction in water quantity and increase in rise which influence the equipment selection and provide a savings either in first cost or operating costs are evident. The water piping system design is also less costly. The designer can, by adding more surface at the coil to achieve the higher chilled water temperature rise, reduce the air quantity and extend these benefits to the air side. This results in savings on all air side equipment such as fans, duct work, etc.

EFFECT ON REFRIGERATION EQUIPMENT

High rise can achieve a saving in refrigeration equipment cost in one of two ways: Smaller, less costly equipment can be selected, or if identical equipment is used, the bhp is reduced. If one of these premises can be proven then the corollary become obvious. This is illustrated by curves shown in Fig. 1.

These curves represent the heat transfer that takes place at the refrigeration plant water chiller. The scales at the left and right of each curve represent the entering and leaving temperatures respectively. The curve at the top shows the change in water temperatures as it passes through the chiller. The line across the bottom is the refrigerant temperature.

The curve on the left is set up for a 10 F rise at the cooling coil. The chilled water leaves the chiller at 45 F and after taking the 10 F rise through the cooling coil, returns to the chiller at 55 F. To handle the heat transfer requirements at this point the machine selected should operate at a suction or refrigerant temperature of 38 F. The area bounded by the entering and leaving temperature scales and the water and refrigerant temperature lines then can be considered to represent the equipment capacity.

The curve on the right in Fig. 1 also shows a 45 F leaving chilled water temperature, but a 15 F rise through the cooling coil. This results in a 60 F return water temperature. The area under the curve is again considered to represent capacity. To obtain the same performance, this area must be the same as that of the curve on the left. This means that the refrigerant or suction temperature must be higher, presuming, of course, the same size equipment. Here the suction temperature is approximately 39 F as compared to 38 F for the 10 F chilled water temperature rise. This represents an improvement in efficiency since the higher the suction temperature the lower the bhp per ton of refrigeration. Note that for each degree (F) higher suction temperature, there is an improvement of approximately 1% in bhp.

Table I shows an example of an actual selection for 14.6 F rise compared with a 10 F rise. The result is an improvement for the former of 27 bph. This may appear to be small when compared to the 1300+ total bph; nevertheless it amounts to a sizable cost reduction. There is a savings here of about $.34/hr or in a locale having an equivalent of 2000 full load operating hours, this savings amounts to $680 per year.

Chilled water systems are usually designed on the basis of an assumed 8 to 10 F temperature rise. . . . But, the author points out, designing the system on a temperature rise higher than 10 F will improve system efficiency and lower first and operating costs.

Also discussed are the effects of the chilled water temperature rise on refrigeration equipment selection, water piping system design, air side equipment selection, and air side system design.

B. P. Morabito is with the Applications Engineering Dept., Machinery and Systems Div, Carrier Corporation and recently addressed the ASHRAE New Orleans Chapter on "Higher Cooling Coil Water Differential and Overall System Economies."

TABLE I—SUMMARY OF MACHINE BHP FOR SINGLE MACHINES

Water rise (F)	14.6	10.0
gpm	2245	3280
Machine bhp	1382	1409
Operating Cost Advantage		
10.0 F Rise		1409 bhp
14.6 F Rise		1382
Saving		27 bhp
Assumed:		
Motor efficiencies		90%
Power charge		$.015/kwh

Saving in operating cost:

$$\frac{27 \times .746 \times .015}{.90} = \$.34/hr$$

TABLE II—SUMMARY OF MACHINE BRAKE HP

Machine Number	Load (Ton)	Machine Brake hp Series 14.6 Rise 2245 gpm	Parallel 14.6 Rise 2245 gpm	Parallel 10.0 Rise 3280 gpm
1	400	428	421	432
2	965	921	996	1000
Totals	1365	1349	1417	1432

Operating Cost Advantage		
Parallel	10.0 F Rise	1432
Series	14.6 F Rise	1349
Saving		83
Assumed:		
Motor efficiencies		90%
Power charge		$.015/kwh

Saving in Operating Cost:

$$\frac{83 \times .746 \times .015}{.90} = \$1.03/hr$$

High rise coils can often offer a further advantage in selection of refrigeration equipment for jobs that call for two machines. The high rise (about 15 F) makes it possible to select this equipment for series chilled water flow. The condenser water flow should be arranged in parallel regardless of how the chillers are piped. This arrangement is illustrated in Fig. 2.

In Fig. 2 the water leaves the cooling coil at 56.1 F after taking a 14.6 F rise in offsetting the load. Since this is a fairly large rise, the water quantity for the load is reduced so that it is possible, with judicious pass arrangements, to put all the water through each cooler. Thus the water is cooled from 56.1 to 45.5 F in the first cooler and from 45.8 to the final temperature of 41.5 F through the second machine. This results in two definite system advantages:

1–Lower total operating bhp or kw input.

2–Reduced refrigeration plant operating time for each machine, resulting in greatly improved operating costs.

The improved bhp is brought about through the selection of the first machine for a leaving water temperature (45.8 F) considerably higher than final requirements. Thus, this machine operates at a refrigerant temperature which, as previously shown, results in a lower bhp per ton.

Table II is a tabulation of an actual comparison of results on a job. Considering the parallel flow selections there is a slight improvement of 1% by selecting for the 14.6 F rise rather than 10 F. However, the big improvement of an additional 5% in total operating bhp comes as a result of the series water flow arrangement; and this at no additional first cost. This advantage, too, must also be attributed to the high rise because series water flow selections are impractical without a rise of approximately 13 or 14 F or more.

For this particular analysis with an improvement of 83 bhp at $.015/per hr, one hour of full load operation results in an operating cost savings of $1.03. If the job calls for 2000 hours of equivalent full load operation, the savings become a real $2060. The best results are achieved with about a 1/3-2/3 split of the load, with the bigger load on the higher temperature machine.

Another advantage of using high rise is improvement in refrigeration plant operation. Assuming the normal 10 F rise at 100% load, shown at the top of Fig. 3, both machines are running and the desired 41.5 F water temperature is achieved. For a 50% split of load, it would appear that when the load is reduced to one half, one machine could be turned off. This is not the case, however, as long as there is a requirement of full water flow at other than design conditions as might exist for a completely interior zone, or for IBM rooms. The second machine cannot be turned off because:

1–The chilled water temperature rise for full flow and half the load in this case is 5 F and the machines have not been selected to provide full capacity (50% of system capacity) with a 5 F rise.

2–Even if the operating machine could provide the desired 41.5 F water temperature, the water bypassing the in-operative machine remains at a higher temperature.

Fig. 1 Effect of water rise

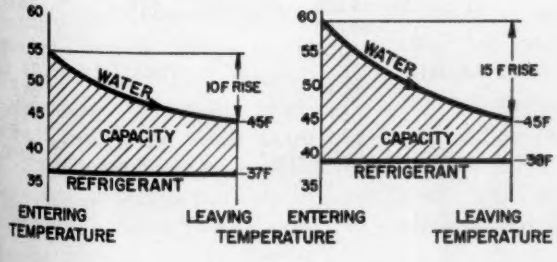
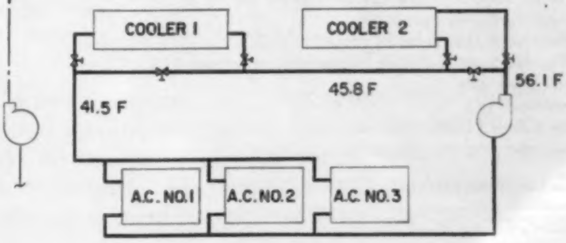


Fig. 2 Series of water flow diagram



When this water mixes with the 41.5 F water from the operating machine, the result is a higher water temperature than needed.

Desired results can be obtained only when unusually low loads are encountered, as represented by the lower diagram in Fig. 3.

EFFECT ON WATER PIPING SYSTEM DESIGN

Since the load for any system does not vary with the system design, the water quantity to be pumped around to the various pieces of equipment is reduced considerably when high rise coils are used. Hence, the distribution piping system can be designed for a lower water flow, with consequent savings in material and installation costs. The significance of the savings depends on the complexity and extensiveness of the piping system.

The requirements in size or quantity of materials for accessories or other components are likewise reduced. For example, less insulation material is required resulting in a savings in job installation. Also, accessories such as strainers, filters and valves can be reduced in size.

The last component of the piping system to be considered is the pump. Frequently the pump size may be reduced because of the lower chilled water quantities involved, whereas pump hp requirements usually remain the same or even go up slightly for two reasons. First, coil pressure drop is increased when designing for a higher rise, and secondly, if series flow through the water chiller is used, the pressure drop at this point is also increased.

Table III shows a tabulation of pump bhp developed to move the water required by the coil through a system where the pressure drop (except for the coil itself) is fixed.

Column 1 represents the coils and designates the chilled water temperature rise qualitatively. The gpm for the coils is shown in column 2.

Column 3 shows the head variation including the coil. Groups A and B are based on a 50 ft pressure drop through the system (other than the coil) while groups C and D are based on a 100 ft pressure drop through the system.

The remaining columns illustrate the comparison of bhp for the various coil selections. The values listed show that there is little change in pump bhp. Thus, savings on the entire water side system are evident and can be attributed to the selection of equipment for higher chilled water temperature rise.

TABLE III—PUMP SUMMARY

Key	gpm	hd	1750 rpm pump bhp	3500 rpm pump bhp
A—Normal Rise	160	65	3.6	5.2
Higher Rise	124	103	5.2	4.8
Highest Rise	102	105	4.8	5.2
B—Normal Rise	120	59	3.2	3.1
Higher Rise	96	85	4.6	3.2
Highest Rise	82	89	4.1	3.0
C—Normal Rise	160	115	8.4*	7.5
Higher Rise	124	153	10.0*	8.0
Highest Rise	102	155	9.5*	7.2
D—Normal Rise	120	109	6.6*	6.4
Higher Rise	96	135	7.0*	6.7
Highest Rise	82	139	8.2*	5.0

* 4 × 2C — out of selection zone

EFFECT ON AIR SIDE EQUIPMENT AND SYSTEMS

The air side of the system ultimately does the work and produces the final results. Here, also, a savings in equipment and systems costs can be realized. The coil is the component which actually determines the chilled water temperature rise.

In order to achieve high rise the

TABLE IV—AIR QUANTITY COMPARISON

Outdoor Air Conditions: 95 F db, 78 F wb
Room Design Conditions: 78 F db, 50% rh
Ventilation Requirements—100 People × 25 cfm/ Person = 2500 cfm

		4 Row		6 Row
Room Sensible Heat		200,000		200,000
OA = 2500 × 1.08 × (95-78) × bf	bf = .25	11,500	bf = .10	4,600
1. Effective Room Sensible ht		211,500		204,600
Room Latent Heat		50,000		50,000
OA = 2500 × (118-72) GR/LB × .68 × bf	bf = .25	19,600	bf = .10	7,800
2. Effective Room Latent ht		69,600		57,800
3. Effective Room Total ht (Item 1 + 2)		281,100		262,400
4. Effective Sensible Heat Factor (Item 1/Item 3)	211.5/281.1 =	.75	204.6/262.4 =	.78
5. Indicated adp		53 F		54 F
6. Selected adp		53 F		54 F
7. Temp Rise (1-bf) (78-adp)		18.7 F		21.6 F
8. Dehumidified Air Quantity		10,500 cfm		8,800 cfm

$$\frac{\text{Eff. Rm. Sensible ht}}{1.08 \times (\text{Temp Rise})}$$

coil must have:

1–Minimum number of water circuits. With long circuits the water has more time in which to take on heat.

2–More outside surface. This permits greater transfer of heat.

3–Both minimum circuits and more outside surface. This will combine both effects to result in the maximum rise.

If the higher chilled water temperature rise is accomplished by decreasing the number of circuits alone, the remainder of the air side equipment and system are not affected in any way. If however, a coil of greater outside surface is selected to achieve this purpose then the entire air side is affected. The air quantity to do the job is reduced allowing a savings in equipment and systems cost. This reduction in air quantity is a direct result of improvement in the coil bypass factor, (Fig. 4).

Assuming an adequate source of chilled water, the final performance of a coil is determined by the air side surface. A measure of the air side surface and, therefore, coil performance is bypass factor; that is, the lower the bypass factor the better the coil performance for the same water flow and entering water temperature. Bypass factor can be considered to be that portion of the air which passes over the coil completely unaltered. This means that, with a lower bypass factor, not only is the water rise higher but the leaving air conditions are lower. Fig. 4 depicts the latter and helps to show the effect on air quantity.

Line AC, Fig. 4, represents the cooling process drawn on a psychrometric chart with a desired ratio of latent to sensible heat. This line intersects the saturation line at a point known as coil effective surface temperature or apparatus dewpoint. In this case the air enters at 85 F and the process line intersects the saturation line at an apparatus dewpoint of 55 F.

The bypass factors as shown for the 4-row and 6-row coils respectively, indicate that the former can bring each pound of air down from 85 to 61 F while the 6-row coil makes it possible to cool each pound down to 58 F. Since in

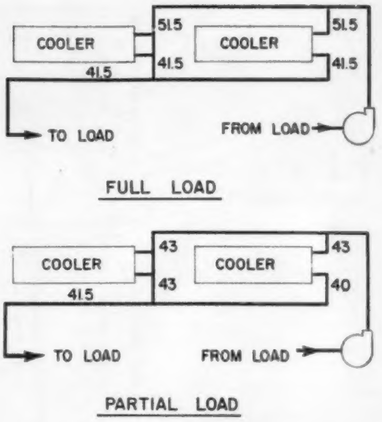


Fig. 3 Parallel water flow diagram

the latter cooler air is available to offset the load, less of it is needed. Carrying out the calculations indicates a requirement of between 10 and 15% less.

Consequently, the system requires smaller ductwork, less insulation and smaller filters. In addition, heating coils, although not reduced in thermal capacity, can be selected for lower face areas. Also, the fan is of lower capacity and bhp. Finally, the motor to drive the fan and move the air has lower kw input requirements.

Every piece of air side equipment except cooling coils is smaller and contributes to a less costly system. This is possible only because the coils are selected for a higher rise. This latter, however, must be accomplished through the use of deeper coils with more outside surface to achieve the benefits on the air side; the benefits will not be achieved by merely going to a minimum number of water circuits. The selection of more surface results in more costly coils, but this is almost invariably a good investment since it helps to achieve savings in many other areas.

COIL SELECTION GUIDES

It is important to know how to select a coil for a high rise and at the same time insure the proper balance of sensible to latent capacity for the job that is being designed.

To design the system properly and obtain the desired results, the coil selection should be integrated with the load calculations. As already noted, selecting a deeper

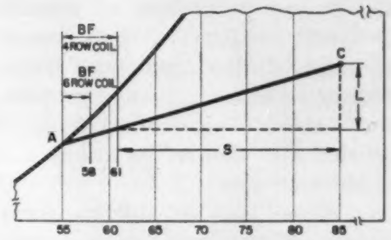


Fig. 4 Effect of bypass factor

coil with greater outside surface and lower bypass factor results in a reduction in dehumidified air quantity requirements. Since bypass factor, by definition, can be considered to represent that portion of the air which passes over the coil completely unaltered, it affects the room load somewhat by the bypassed portion of the outside air. Therefore, it is necessary to establish the coil selection in conjunction with the cooling load estimate.

The tabulation in Table IV shows that, for the same job with the same design conditions, ventilation requirements, room sensible load and room latent load, the following conditions result for 4 and 6-row coils, respectively, selected to accomplish the same results.

1–Bypass air sensible load of 11,500 to 4,600 Btu/hr.

2–An effective RSH of 211,500 to 204,600 Btu/hr.

3–Bypass air latent load of 19,600 to 7800 Btu/hr

4–An effective RLH of 69,600 to 57,800 Btu/hr

5–The effective room heat is 281,000 to 262,400 Btu/hr. This is only room total load. Overall performance including bypassed air is exactly the same for both selections.

6–Thus with the resulting effective sensible heat factor and indicated apparatus dewpoint or effective coil surface temperature, the air quantity is 10,500 and 8800 cfm respectively.

This reveals a considerable reduction in air quantity from the selection of the 6-row coil.

Specifications for the coil, however, have not been finally established except for the outside surface requirements, which with the final air quantity determined provide

the proper proportion of sensible to latent capacity. It is necessary to establish the amount of water required and actual water temperature rise. This information is needed for the refrigeration machine selection.

When the air side performance and water side performance of the cooling coil are separated in this manner, the latter can be determined from ratings based on apparatus dewpoint or effective surface temperature. Since the coil depth and type of surface are established in conjunction with the cooling load estimate and actual coil face area is established by the air quantity determined from the estimate, the rating for this specific coil need only deal with the water side performance. That is, the coil size and type surface are set and the rating for the coil in question will show the circuiting, water quantity and water side pressure drop for the load indicated. A sample of this type rating is shown in Fig. 5.

The answers desired can be determined easily and quickly. Divide the grand total heat by the difference between the coil effective surface temperature (ADP) and the desired entering water temperature. This gives a value Q which is a heat transfer index. With Q the design engineer enters the chart and moves up to the proper coil face velocity and reads the required chilled water quantity for the minimum and maximum circuited coils offered.

Once the gpm is determined the chilled water temperature rise through the coil can be readily established. If a deep coil with minimum circuits is used, the temperature rise is usually high.

If a higher rise is required, reduce the entering chilled water temperature. This gives a lower value of Q and results in less water and higher rise. A change in outside surface cannot be made at this point without adjusting the air quantity regardless of the coil selection method used.

To facilitate selections from entering and leaving conditions, a simple graphic means has been devised to convert this data to the information required to use the ratings described. Fig. 6 shows this conversion chart.

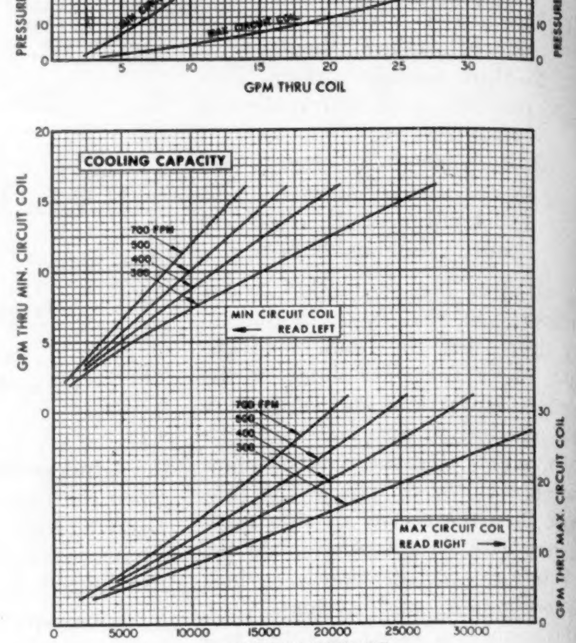


Fig. 5 Chilled water ratings

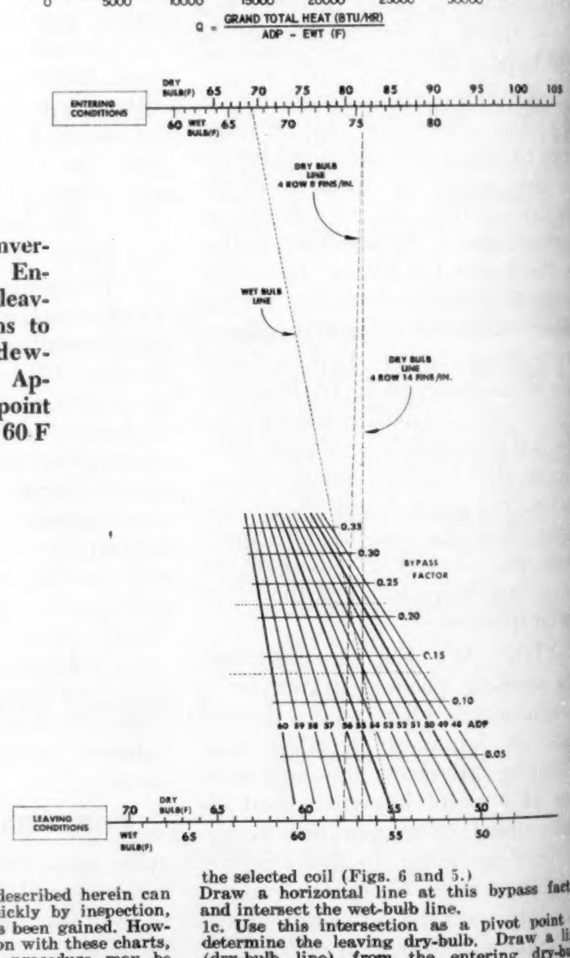


Fig. 6 Conversion chart. Entering and leaving conditions to apparatus dewpoint (adp). Apparatus dewpoint range, 48 to 60 F

PROCEDURE:
The coil selection method described herein can usually be applied very quickly by inspection, after a little experience has been gained. However, to aid in familiarization with these charts, the following step-by-step procedure may be used:

1a. Draw a line on Fig. 6 connecting the entering and leaving wet-bulb temperature (wet-bulb line).

1b. Select a coil. Unless the row's depth and/or fin spacing is specified, check the coils in the following order to determine the optimum selection:

(1) 2-row, 8 fins/in.
(2) 2-row, 14 fins/in.
(3) 3-row, 8 fins/in.
(4) 3-row, 14 fins/in., etc.

Use the coil face velocity determined in selecting the unit size to find the bypass factor for the selected coil (Figs. 6 and 5.) Draw a horizontal line at this bypass factor and intersect the wet-bulb line.

1c. Use this intersection as a pivot point to determine the leaving dry-bulb. Draw a line (dry-bulb line) from the entering dry-bulb through the pivot point to the leaving dry-bulb. If the leaving dry-bulb is equal to or less than that required, read the adp at the pivot point. If the leaving dry-bulb is above that required, repeat Steps 1b and 1c for another coil.

2. Use the adp determined in Step 1c to check the refrigerant or water side performance of the selected coil.

In the event that the refrigerant or water side performance will not satisfy requirements, such as load and refrigerant temperature or gpm and pressure drop, etc., select another coil using the same procedure.

All ratings, of course, are not based on the coil effective surface temperature and bypass factor approach. Coil performance can be shown on the basis of entering and leaving conditions either in tabular or curve form or actual modified basic data.

If desired space conditions are to be achieved, first select the manufacturer's coil with the outside surface that gives the sought performance. This can be established by selecting the coil which satisfies the leaving dry-bulb condition as well as the total load and entering wet and dry-bulb temperatures. Then the entering water temperature may be varied to give the desired rise. This sets the conditions on which the refrigeration machine can be selected. Only in this way can all the system components be in balance and produce the desired conditions at design load. If this is not followed, variations in either temperature or humidity may be expected.

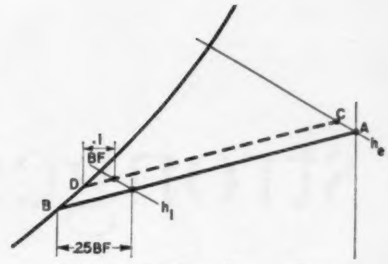


Fig. 7 Coil surface effect

Fig. 7 illustrates what happens if the outside coil surface requirements are disregarded. Assume that a 4-row coil has been selected for a specific air quantity to result in performance designated by AB on this skeleton chart. If, however, a coil with a .1 bypass factor (6-row) instead of .25 is used to try and obtain a high rise, then the leaving condition moves up the wet-bulb line to the .1 balance point and the resulting room condition will be at C instead of A. Therefore, once air quantity is established the amount of outside coil surface cannot be manipulated without affecting design conditions.

It is not suggested here that the use of high rise coils will solve all of the designer's problems. However, sufficient investigations have been made on various systems and parts of systems to prove that benefits can be derived with this approach.

BULLETINS and CATALOGS

Hydronic Installations. Explained in this bulletin is the Six-Point Program developed by this company to aid installation of hydronic heating and cooling systems. Topics discussed include heat loss calculation; sizing of boiler, radiation, pumps and piping; organized installation procedure; and test-rated equipment.
American Radiator & Standard Sanitary Corporation, Plumbing & Heating Div, 40 W. 40th St., New York 18, N. Y.

Indicating Pneumatic Controllers. Specifications for these instruments are given and models are listed for control of pressure, vacuum, liquid level, flow, temperature and humidity. Featured is the new A/D Control Unit. Bulletin DM-58, four pages.
Bristol Company, Waterbury 20, Conn.

Industrial Insulation. Newest industrial insulation products added to this line are calcium silicate and mineral wool block for temperatures up to 1900 F. Listed in four-page Bulletin 6451 are all types of insulations and insulating cements for use in power, chemical, petroleum, petrochemical and manufacturing industries. Tabular product selection guide indicates insulation applications for high temperature and superheated surfaces; high, medium and low pressure steam lines; cold water piping; heating and air conditioning ducts; and boiler breechings.
Philip Carey Manufacturing Company, 320 S. Wayne Ave., Cincinnati 15, Ohio.

Steel Pipe. Uses of welded steel pipe ranging from heating, plumbing and sprinkler systems to snow melting and ice rinks are illustrated in 20-page Bulletin 509. Six pages of specification tables for three weights of ⅛ to 12-in. pipe and couplings are included.
National Supply Company, Two Gateway Ctr., Pittsburgh 22, Pa.

Modular Diffuser. Forty-page Catalog No. 460, containing sound ratings, performance data and engineering information, is descriptive of this plastics modular diffuser. Combinations of three types of modules provide a number of air patterns and sizes. Diffusers are designed for any type of ceiling construction and are adaptable to tile and metal pan suspension systems.
Carnes Corporation, Verona, Wisc.

Piping Systems. Case history studies of 17 power plants and 15 industrial plants utilizing piping systems fabricated and erected by this company are included in 24-page Bulletin 60B. Exterior and interior photographs are presented with details on each job. Also contained is a section on the company's line of welding fittings and flanges.
Midwest Piping Company, Inc., 1450 S. Second St., St. Louis 4, Mo.

Structural Clay Tile. Eight basic designs and five basic sizes of Mal-Tex tiles are offered in four-page Bulletin MFL-460-132, which includes suggestions on use of the units to form many patterns for partition and load-bearing applications.
Malvern Flue Lining, Inc., Malvern, Ohio.

V-Belt Drives. Design advantages of Poly-V belt drives are outlined in four-page bulletin A2343. Illustrations show how single unit design of the belt provides twice the tractive surface per in. of sheave width and can deliver up to 50% more power in two-thirds the space of conventional belt drives. Specifications relative to in-operation characteristics of vibration, heave diam and speed ratios are offered and condensed hp rating tables are featured.
Dayton Industrial Products Company 2001 Janice Ave., Melrose Park, Ill.

Corrosion Inhibitor. Hagatreat Formula No. 168, a corrosion inhibiting compound for treatment of recirculating cooling water systems, is the subject of four-page Bulletin CSP-935.
(*Continued on page 73*)

"...the strongest possible pr

It is with deep personal regret that, as I assume the Chairmanship of the Research and Technical Committee, one of my first duties is to announce to the membership that our able Director of Research, Burgess H. Jennings, has decided to return to Northwestern University this fall, to resume his position as Professor of Mechanical Engineering. As many of you know, Professor Jennings took a one-year leave-of-absence from his duties three years ago to help the Society advance its research program at an accelerated pace. It was almost immediately evident that the task was too great to be accomplished in a single year, but Professor Jennings was able to extend his leave for two more years. However, since University regulations prevent staff members from being away from the University for more than three years, Professor Jennings has now made his decision to return to Northwestern. Fortunately, he will be able to spend a considerable portion of his time with our Laboratory during the next few months. This will help materially during a period which appears particularly difficult for Society research.

I am sure it is unnecessary to review the long history of research carried on by one of our two parent societies, ASHAE, for the past 42 years. All that is necessary to become convinced of its value is to refer to the published TRANSACTIONS and to the wealth of references to this work in the ASHRAE GUIDE. Much of this scientific and engineering data has come from our own Laboratory and from research encouraged by Society funds in universities. ASRE also conducted a cooperative research program prior to the merger, from which a number of valuable technical papers were developed.

At the time of the merger, there was considerable debate over many sections of the By-laws. And, as might be expected, under the circumstances, there were all shades of opinion concerning the scope and objectives of ASHRAE research. The important point to emphasize here is that Section 6 of the Agreement of Consolidation and Sections 8 and 10 of the By-laws have a very definite bearing on the Society's research activities. These paragraphs are quoted as follows:

Agreement of Consolidation

The purpose of the Society shall be:

6.1 (b) To encourage and **conduct** scientific research and the study of principles and methods in the fields of heating, refrigeration, and air conditioning and ventilation . . .

6.2 (e) To cooperate with governmental agencies and with universities, colleges, schools, and other organizations . . . , and to establish scholarships and make contributions, grants, and awards in furtherance of the foregoing purposes.

By-laws

8.8.23 The Research and Technical Committee, subject to the direction of the Board of Directors, shall **conduct** and coordinate basic research and technical studies in the fields of . . .

10.2 Allocation of Dues for Research. Unless changed by the Society at an Annual or Special Meeting, a percentage determined by the Board of Directors of the dues shall be allocated for basic or fundamental research . . . "

Thus, it appears that the Agreement of Consolidation requires the Society to **conduct** research as well as encourage it in the fields of technology it serves, and the By-laws provide means for financing the research program through allocation of a percentage of membership dues. Here it should be pointed out that whereas the old ASHAE By-laws allocated a fixed 40% of the Society dues to the research program, ASHRAE By-laws leave the amount allocated to the discretion of the Board. The decision on this allocation is normally made annually when action is taken on the Society budget.

Additional funds for research are derived from industry and personal contributions to the program, and these in the past have been an important source of income. Furthermore, it has been a regular practice of International Exposition Company, Inc., which conducts the biennial Exposition of heating, refrigeration and air conditioning, to make generous contributions to the Society's research program.

Since the merger a number of events have occurred which should be noted in this report. President Cecil Boling appointed an ad hoc committee to study the status and future of Society research. This committee solicited opinions from many informed members, and submitted its report last winter. The report precipitated a debate on all aspects of the research problem. Some members advocated abandonment of the Cleveland Laboratory, and others argued vigorously in favor of continuing it and expanding its activities. After hearing all sides, the Board of Directors went on record overwhelmingly in favor of a strong continuing research program, and charged Research and Technical Committee with the task of recommending policies, formulating programs, and submitting specific plans to the Board.

One of the points made by the

program at the Laboratory..."

E. P. PALMATIER
Chairman
ASHRAE
Research and Technical
Committee

ad hoc committee report was, that since the Society Laboratory was established, our industry has grown enormously. Research conducted in corporate laboratories today greatly overshadows the Society's program, at least in scale of effort. Moreover, both the Board and Research and Technical Committee felt that to conduct an effective and efficient operation, an annual research budget of $300,000, and eventually at least $500,000, was indicated, together with improved laboratory facilities. A special Building Committee of the old ASHAE, continued after the merger, studied various aspects of the facilities program, including the question of purchase or construction of a new laboratory building in a different location.

Against this background, your Research and Technical Committee had to make some decisions. It has repeatedly gone on record in favor of the strongest possible program at the laboratory augmented by an effective cooperative program with universities. To give the reader an idea of the scale of each, during the year just passed, about $215,000 was allocated to research, of which $21,000 was distributed as grants to other laboratories. During the coming year, $200,000 is budgeted, of which about $25,000 will be used for cooperative research.

How best to utilize this rather limited budget for 1960-61 was the question to which your R & T Committee directed its attention last February at Dallas. It had the choice of continuing a diversified program of many relatively small projects, or concentrating on a few larger scale investigations. Since for many years the Society membership has shown strong interest in, and given support to, studies on the reactions of people to their atmospheric environment, R & T Committee reached the decision that the Society's reputation for outstanding contributions could best be maintained by accenting the environmental research program. I should point out that as a result of past membership interest in this program, the Cleveland Laboratory possesses exceptionally good facilities for exploring the effects of thermal environment on people, as well as odor sensations and methods of combatting odors. It therefore makes very good sense to utilize these facilities to the limit of the funds available.

We of the Research and Technical Committee believe wholeheartedly in Society - conducted research, and believe each member should be proud to contribute a portion of his dues to advance the frontiers of unknown areas of the sciences on which he depends for his livelihood. We also feel that if greater financial support were available from the membership and from our industry, an effective expanded program could be organized and maintained. We have recommended to the Board that as a matter of fiscal policy, a minimum percentage of membership dues be allocated to research because this type of work cannot be carried out with short-term financing.

But all these questions are not yet settled. As a Society, we have not spelled out a definitive policy for the future on research. Accordingly, at the Vancouver meeting, President Walter Grant directed the 1960-61 Long Range Planning Committee, headed by J. Donald Kroeker as Chairman, to make a comprehensive study of the entire research problem—policy and objectives, scope, Society-conducted research, cooperative research, facilities, administration, and financing—and report 30 days prior to the Semiannual Meeting in Chicago next February.

Moreover, the Board has agreed that no long-range decisions should be made until the results of this study are at hand for evaluation. The membership of Long Range Planning Committee has been selected with great care to reflect long experience in Society affairs, represent all membership interest areas, and make available the highest degree of competence and impartiality.

We want to know what you, the members, think. If you care to write me, I would be happy to hear from you, and will gladly pass along your viewpoints to Research and Technical Committee, to the Officers of the Society, and to Long Range Planning Committee.

On two or three other occasions during the year, it will be my pleasure to write more on the subject of ASHRAE research. In future articles, I hope to tell you more of what is happening at the Cleveland Laboratory and at the universities which are carrying on sponsored work for the Society.

Meetings ahead

August 23-25—Sixth Cryogenics Engineering Conference, Boulder, Colo.

October 10-12 – American Gas Association, Annual Convention, Atlantic City, N. J.

October 20-23—Refrigeration Service Engineers Society, Annual Convention, Portland, Ore.

October 25-27 – American Standards Association, 11th National Conference on Standards, New York, N.Y.

October 28-November 2—Air Conditioning and Refrigeration Wholesalers, Silver Anniversary Convention, SS Hanseatic.

October 29-November 4 – Oil Heat Institute, Diamond Jubilee Cruise and Management Conference, HMS Queen of Bermuda.

October 31-November 3—Institute of Boiler and Radiator Manufacturers, Semiannual Meeting, Absecon, N.J.

November 14-17—National Warm Air Heating and Air Conditioning Association, 47th Annual Meeting, Cleveland, Ohio.

November 18-22 – Air Conditioning and Refrigeration Institute, Annual Meeting, Hollywood Beach, Fla.

November 20-23 – Refrigeration and Air Conditioning Contractors Association, Annual Meeting, Miami, Fla.

November 27-December 2—American Society of Mechanical Engineers, Annual Meeting, New York, N. Y.

November 28-December 2—24th National Exposition of Power and Mechanical Engineering, New York, N. Y.

December 1-2 – National Association of Practical Refrigerating Engineers, Annual Meeting, St. Louis, Mo.

February 13-16—American Society of Heating, Refrigerating and Air Conditioning Engineers, Semiannual Meeting, Chicago, Ill.

February 13-16 – 15th International Heating and Air-Conditioning Exposition, Chicago, Ill.

People

Edwin H. Young, Professor of Chemical and Metallurgical Engineering at the University of Michigan, has been elected Vice President of the Michigan Society of Professional Engineers. He was installed on May 21st and will serve until June 30, 1961. A member of the staff of the University continuously for the past 13 years, he has been Director of the Wolverine Tube Finned Tube Heat Transfer Project at the University's Research Institute for the past seven years and, for the past two years, has served as State Director of MSPE. Co-author with **Prof. L. E. Brownell** of the book "Process Equipment Design," he is currently working with **Prof. D. L. Katz** on a manuscript for a book to be entitled "Heat Transfer Through Finned Tubes," and has co-authored fifteen technical papers on the same subject.

Charles W. Wheeler, who died recently at the age of 72, was a past-President and Charter Member of the Pittsburgh Chapter of the former ASHAE and a Life Member of the National Society. Active in Society affairs since his election to membership in 1916, he participated in solicitation of funds to start the Research Laboratory. When Pittsburgh Chapter was organized in 1919, he began three years of service as its Secretary, followed by his election as Vice President in 1924 and President in 1926. He was a member of the Board of Governors in 1922, 1927 and 1931.

P. B. Gordon, past-President of the former ASHAE, newly-elected ASHRAE Fellow and Vice President of Wolff & Munier, Inc., has been elected Vice President of the Building Research Institute. Election to ASHAE Council in 1952 was followed by election to the offices of 2nd Vice President in 1955, 1st Vice President and Chairman of Council in 1957 and President in 1958. He has, in his long career of service with ASHAE, been a member of numerous committees, among them Guide Publications, Standards, Program and Papers, Building, Ways and Means, ASHAE-ASRE Committee on Cooperation, Long-Range Planning, Chapter Relations, F. Paul Anderson, Guide Advisory, ASHAE-AIA Committee on Cooperation and TAC on Panel Heating and Cooling. He was awarded the F. Paul Anderson Medal for 1960, in recognition of distinguished service to the Society and the industry.

Leon E. Jeanneret, Manager of Welded Tubing Sales for Babcock & Wilcox Company's Tubular Products Div, retired on July 1st after 43 years of service. He has supervised sales of welded tubing at the div's Alliance, Ohio, plant from the time production started in 1943. During his career with the company, he has held a variety of operational and sales management positions. He opened the first district sales office for the Tubular Products Div in Cleveland in 1923, and opened the Detroit office in 1931. In 1933, he was named Manager of Development Sales for the div, and he served as Assistant Manager of Tubular Product Sales for the eastern part of the nation before he was selected to head welding tube sales. He is a graduate of the Columbia University School of Engineering, Class of 1911.

E. T. Coles, currently National Secretary of Refrigeration Service Engineers Society and a Director of the Canadian Refrigeration Manufacturers Association, has been named Sales Manager for Penn Controls Ltd.

Jerome Podell has been appointed Chief Engineer of Hi-Press Air Conditioning of America, Inc. Formerly Chief Engineer with the firm of S. W. Brown, he has participated in the design and installation of air conditioning and refrigeration systems on ships of the Moore-McCormack, American Export and French Lines. Before joining S. W. Brown in 1955, he served as application and design engineer for Carrier Corporation.

J. F. Raether, deceased, was instrumental in organization of the Twin City Section of the former ASRE, of which he was Chairman in 1945-46 and Section Director for the term ending May, 1948. He had been associated with Westerlin and Campbell Company in an engineering capacity from 1912 until his retirement in 1954. His membership in ASRE dates back to 1919.

P. J. Marschall, member of ASHRAE Board of Directors and newly-elected Fellow of the Society, has been appointed Vice President in Charge of Engineering, Abbott Laboratories, advancing from his former position as Manager of Engineering. Since the merger, he has served on the Finance, Meetings Arrangements, Guide and Data Book, General and Administrative Coordinating, Building and Emblem and Insignia Committees and as Coordinator for Regional Affairs in Region VI and Consultant for Region V. Formerly Director of Region II and a member of ASHAE Council in 1957, he has been a member of several ASHAE committees, including: Guide Publication, Joint Committee on Standards for Comfort Air Conditioning, Publication, TAC on Relation of Body Changes to Air Changes and TAC on Industrial Environment.

Charles H. Burkhardt, Secretary-Treasurer of the Oil Heat Institute of America and National Secretary of its Distribution Div, was appointed Managing Director at a meeting of the Executive Committee on May 31st. With the Institute for almost six years, he will continue in both of his previous capacities. Educated at St. John's University, he has done considerable graduate work in heat engineering, combustion, refrigeration and air conditioning and has taught on the vocational, technical and college levels. Since leaving the teaching field, he has been Director of Field Education, Perfex Corporation; Heating Editor, Scott Publishing Company; Manager, Paragon Maintenance Company; and an industrial specialist for the Federal Government. He is the author of several books, including "Domestic Oil Burners" and "Residential and Commercial Air Conditioning."

Russell Gray and **Charles V. Fenn** are ASHRAE members recently elevated to the Executive Vice Presidency of Carrier Corporation. Vice President Fenn has also been elected a director of the company under a program of rotation which will enable various officers to serve as board members for two-year terms. Concurrent with these elections was formation of a new div of the organization, Carrier Air Conditioning Company, of which Vice President Gray has been designated President, with Mr. Fenn as his assistant.

John Platts, presently Vice President and General Manager of the Evansville Div of Whirlpool Corporation, has been named Vice President, Refrigeration Products, of the company's newly formed Refrigeration Products Div. Vice President since 1959, he joined the company in 1941 as an assemblyman at the St. Joseph Div, subsequently holding positions of increasing responsibility, including Director of Purchases and Works Manager. He was promoted to General Manager of the Evansville Div in 1957.

William F. Delany succeeds **A. A. Kernjack** as Manager of the Detroit office of Trane Company, following the retirement of the latter to concentrate on an account which he developed for Trane. With the Detroit office for ten years, Delany joined Trane in 1945, managing the Engineering Dept for sales offices in Canada. Kernjack joined the company in 1934, after graduation from the University of Wisconsin, and has since held several managerial positions. He had been manager of the Detroit office since 1950.

John Brannick, appointed Refrigeration Staff Engineer for Bohn Aluminum & Brass Corporation, will be responsible for refrigeration and general aluminum fabrication applications and new product development at the Adrian, Mich., plant. He is a graduate mechanical engineer of the University of Tennessee.

William S. Orton has been named Field Representative for General Controls Company's Air Conditioning-Refrigeration Controls Div. Before joining the organization, he had been a sales engineer for Fabricated Metals Company and President of Nels H. Rosberg, Inc. A Charter Member of the former ASRE, he is also a member and past-President (1948) of the National Association of Practical Refrigerating Engineers.

Others are saying—

that . . . . . . heat requirements are more important than heat losses when heating a building. Ways in which heat requirements should be adjusted to allow for the effect of heat radiation, temperature gradient and such are discussed and the author's own experimental investigations are described. These latter were concerned with the comparative performance of radiators and baseboard heating in rooms in private houses. Conclusion reached is that a widely distributed heat input at low level around the exposed perimeter of a room is likely to show a reduction in heat requirement of 10%. In larger buildings, combined use of downward radiation, with min convection, and perimeter heating is cited as showing a similar saving. *Journal of the Institution of Heating and Ventilating Engineers, June 1960, p 82 (England).*

that . . . . . . use of chilled water for air conditioning of college and university facilities offers advantages which have made it favored for this purpose. It is cited as being the best refrigerating medium in use from the standpoint of control, being well adapted to either precise modulation or fast on-off control. It makes possible remote location of refrigeration equipment, central location of cooling tower or air-cooled condensing equipment, use of heavy-duty reciprocating refrigeration equipment or application of hermetic centrifugal equipment, and it offers flexibility in provision for varying loads in different areas. *Consulting Engineer, July 1960, p 96.*

> *"To know is one thing, merely to believe one knows is another. To know is science, but merely to believe one knows is ignorance."*
>
> —HIPPOCRATES

Candidates for ASHRAE Membership

Following is a list of 124 candidates for membership or advancement in membership grade. Members are requested to assume their full share of responsibility in the acceptance of these candidates for membership by advising the Executive Secretary on or before August 31, 1960 of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted by the Board of Directors.

Note:
* Advancement † Reinstatement

REGION I

Connecticut

DAY, G. L., Mfgs. Rep., Cavanagh & Day, Stamford.

HUSCHKE, D. R.,* Maint. Engr., Nuclear Fuel, No. Branford.

Massachusetts

JOHNSTON, W. F., Appl. Engr., Westinghouse, Sturtevant Div., Hyde Park.

SHAW, D. N., Design Engr., Worthington Corp., Holyoke.

WILSON, D. G.,* Pfc US 51432620, Hq. & Hq. Co. 2d B.G. 60th Inf. Fort Devens.

New Jersey

GAYLORD, P. M.,* Appl. Engr., Worthington Corp., East Orange.

HEPP, A. M., Proj. Engr., Thomas Electronics Inc., Passaic.

LIEBENDORFER, R. E., Div. Mfg. Mgr., Worthington Corp., East Orange.

MOYES, D. S., Appl. Engr., Worthington Corp., A. C. & R. Sales, East Orange.

New York

APPLEBY, L. V.,* Owner, L. V. Appleby Co., Albany.

BROWN, D. V.,* Estimator, Mechanical Contractor, Buffalo.

DERYCKE, E. I.,* Sales Engr., R. P. Fedder Co., Rochester.

GAUTHIER, S. L., Chief Engr., Consolidated Sheet Metal Works, Inc., Utica.

GEREI, ROBERT, Design Engr., Buensod-Stacey, Inc., New York.

GESLER, I. L.,* Appl. Engr., Lennox Industries, Syracuse.

GOKHALE, A. N.,* Prod. Engr., Welbuilt Corp., Maspeth, L. I.

GUARINO, L. J., Group Supvsr., H. K. Ferguson Co., New York.

HATTER, E. E. Jr.,* Partner, Hatter Fuel Co., Cortland.

INGHAM, R. L., Zone Mgr., Delco App. Div., General Motors Corp., Spencertown.

KOEPCKE, J. M., Dvlpt. Engr., Carrier Corp., Syracuse.

LEUNG, PAUL,* Dvlpt. Engr., Carrier Corp., Syracuse.

NACHTRIEB, J. G. III,* Field Engr., Frank P. Langley Co., Buffalo.

O'GRADY, R. F., Pres., O'Grady Heating Inc., Rochester.

RIZWANI, M. A.,* Designer, J. C. Penney Co. Constr. Div., New York.

ROONEY, A. E. JR., Dist. Sales Repr., Carrier Corp., E. Syracuse.

SEITZ, R. F.,* Pres., Eval Contractors, Inc., Blue Point.

STEINBERG, YALE, Owner, Town & Country Utilities Inc., Inwood.

WEIN, FREDERICK, Plumbing Designer, Voorhees Walker Smith Smith & Haines, New York.

WEINRUB, H. A., Technician, Bruno, N. Y., New York.

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280-TON REFRIGERATION SYSTEM TO SERVE OPEN-AIR RINKS

Two large artificial ice rinks utilizing A. M. Byers Company pipe are under construction in western Pennsylvania. Both are of the permanent type, with wrought iron brine piping embedded in a concrete slab surfaced with terrazzo.

North Park Rink uses approximately 76,200 ft of 1¼-in. diam 4D wrought iron pipe spaced on four-in. centers. Larger size pipe (six, eight and ten in. diam) was installed for supply and return lines. 280 ton of refrigeration supply the open-air rink, with a 1.22 calcium chloride solution circulated through the pipe runs. All pipe joints are acetylene welded and return bends are used at the end of the pipe runs. Similar construction is planned for South Park Rink.

CHILLED WATER COOLING PROTECTS BANANA BOAT'S CARGO

Nuclei of the refrigeration system servicing the 266-ft MV Cubahama, built as a dry cargo banana ship, are three 60-ton Trane Cold Generator package reciprocating water chillers adapted to diesel drive. Chilled water is delivered to pipe coils in a central equipment room. Fans pass outside air over the coils to cool it before it is distributed through duct work to the holds. A constant temperature of 54 F is maintained in the holds, which were insulated with three-in. Styrafoam.

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BULLETINS

(*Continued from page* 65)

Compound is cited as providing corrosion control, eliminating sludge deposition, permitting more concentration of make-up water and simplifying control procedures.
Calgon Company, div of Hagan Chemicals & Controls, Inc., Hagan Ctr., Pittsburgh 30, Pa.

High Temperature Water Generators. Designed for use by engineers and others interested in high temperature water, space and process heating systems, 36-page Bulletin G-92 describes varied applications of the two basic high temperature water systems designed by this company to utilize conventional water tube steam boilers or forced circulation boilers.
Babcock & Wilcox Company, Boiler Div, Barberton, Ohio.

Stepless Variable Speed Drives. Typical applications of these drives for fractional hp use are listed in 16-page Catalog ZM-400C560. Operating features and installation suggestions are accompanied by numerous diagrams. Details on all types of units in the line are included.
Zero-Max Company, 1952 Lyndale Ave. S., Minneapolis 5, Minn.

Prefabricated Duct Silencers. Describing and giving certified acoustic and pressure drop data for this manufacturer's line of rectangular duct silencers is four-page Bulletin B-5. Units discussed include models for special applications such as on high temperature or extra high attenuation units.
Silence Inc., P. O. Box 21, Farmingdale, N. Y.

Airfoil Bladed Fans. Features of Series 116 centrifugal-type airfoil bladed fans are discussed and suggested applications are listed in 60-page Bulletin A-1103. Construction for Class I, II and III fans is described and illustrated, with emphasis placed on low velocity rim wheel design. Two types of blade construction and standard and alternate bearings for the three fan classes are covered. Also included are a discussion of modifications to the design, a section on methods of volume control and 30 pages of capacity tables for standard air conditions.
American Radiator & Standard Sanitary Corporation, Industrial Div, Detroit 32, Mich.

Industrial V-Belts. Covered in 52-page Catalog 260 is this company's complete line of industrial V-belts, including cog-belt and fractional hp types as well as sheaves and industrial hose. Data on sizes, dimensions and prices are given. Information on molded braided, horizontal braided, machine-built wrapped fabric, hand-built wrapped fabric and woven jacket hose is listed in a special section on hoses.
Dayton Industrial Products Company, 2001 Janice Ave., Melrose Park, Ill.

Fluid Flow Rate Alarms. Four-page Bulletin 175 gives details and examples of rotameter accessories to provide signalling and simple control functions. Units are illustrated and features and specifications are listed.
Brooks Rotameter Company, P. O. Box 432, Lansdale, Pa.

Air Defrost Blast Freezer Line. For such low temperature applications as ice cream hardening and meat, fish and poultry storage rooms, this line of air defrost blast freezers is offered in eight sizes ranging from 6300 through 36,000 cfm. Vertical and horizontal air discharge models are available in each size to enable the equipment to be installed in any location where warm air is available to defrost the fin coils. Four-page Bulletin 036 presents technical data, dimensions and diagrammatic illustrations.
Vilter Manufacturing Company, Milwaukee 7, Wisc.

Air Control Systems. Presented in a 20-page catalog is information on perimeter and ceiling units, perimeter blender units, cooling and heating cycles, mixing boxes and constant volume mixing units. Descriptive and detailed charts are presented for each separate item and contain pressure, sound ratings and sound levels. Engineering drawings, with dimensions, unit sizes, inlet OD and approximate shipping weight are given and two pages show illustrations of recent installations.
Thermotank Inc., 11191 Lappin Ave., Detroit 34, Mich.

Square and Rectangular Tubing. Contained in a four-page bulletin is a quick reference weight chart for square and rectangular welded steel tubing, in addition to a comprehensive listing of tubing tolerances for twist, straightness, cutting length, corner radii and diagonal dimensions.
Standard Tube Company, 24400 Plymouth Rd., Detroit 39, Mich.

Corrosion Inhibitor. Data on Wrico 98, a corrosion inhibitor for use in recirculating cooling water systems where reducing agents such as hydrogen sulphide may be present, is contained in a flyer.
Wright Chemical Corporation, 627 W. Lake St., Chicago 6, Ill.

Condensers. Intended as an aid and information guide for refrigeration, air conditioning and vending machine engineers, this catalog gives extensive dimensional and parts specifications for custom and standard steel fin condensers, which can be assembled with either ⅜ or ¼-in. tubing to meet exact heat transfer requirements.

(*Continued on page* 79)

They Wanted to Know

Inquiries of the month to ASHRAE Headquarters covered many points as to technical facts, standards, practices, personnel and published references. From these, the following have been selected and condensed as being those replies of some general interest and value to ASHRAE members.

GAS FUME SEEPAGE

To ASHRAE:

We have had a request from one of our members for a system designed to eliminate fumes from gasoline originating in a house garage. With all doors closed fumes seep into the living quarters, when the garage is attached to the house in a split-level design. An exhaust fan installation has been attempted, but with little success. Commercial garage installations do not seem practical. A simple solution is requested, mechanical or non-mechanical, to eliminate these odors from the living quarters.

K. A. B.

This problem has not come to our attention previously. Usually the door between the garage and the living quarters in a split-level house is sufficiently tight to keep out most of the infiltration of the gasoline fumes. Since you state that an exhaust fan has been installed with little success, it appears that there is an unusual amount of gasoline fumes being released from some source. Apparently there is a leak of some sort in the vehicle being stored in the garage. This could also be traced to gasoline-operated lawn mowers or other such devices which frequently have gasoline leaks. The simplest solution to the problem, of course, would be to eliminate the source of fumes. We are sorry, but this is not a general problem to which a standard solution may be applied.

AIR CONDITIONING OF SCHOOLS

To ASHRAE:

Do you have any information relating to school facilities? The School Housing Section of the U. S. Office of Education is collecting data about organizations and associations which are related to the field of school planning and construction. Any literature about your organization and about publications produced by you would be most helpful.

M. R. A. J.

ASHRAE is very much interested in the heating and air conditioning of schools. There is a chapter in the ASHRAE GUIDE AND DATA BOOK on the subject; a Bulletin covering the Symposium on School Heating, Ventilating and Air Conditioning which was presented at the 1958 Annual Meeting of ASHAE, a precedent society; and one of the forums at the ASHRAE Annual Meeting in Vancouver was keyed to the subject of school heating.

LOW PRESSURE DUCT SYSTEMS

To ASHRAE:

Duct work is being installed for use in low pressure systems for a veterans hospital, the joints in which are of the mechanical type, (S-Slip, Pocket, Pittsburgh Bar or Angle Bar Slip) and formed with Pittsburgh Longitudinal seams. The highest S.P. in the various low pressure duct systems is 2.0 in. hydrostatic and the lowest is 0.10 in. hydrostatic. Would it be advisable to tape or apply mastic to the joints? Is it necessary to make further provision for tight joints under the above static pressure limits when the mechanical joints are well made and tight?

H. L. C.

There is no mention of the requirement to seal joints of duct work in low pressure systems in the duct manual published by the Sheet Metal and Air Conditioning National Contractors Association. Information in the ASHRAE GUIDE AND DATA BOOK does include a recommendation for sealing such duct-work joints in high pressure duct systems. Since your system is in the category of low pressure duct systems, it would seem that it is not necessary to seal the duct joints. We suggest that you submit the specific problem to the Sheet Metal and Air Conditioning National Contractors Association. Also, it is possible that your local or state building codes will have requirements relative to such joints.

PROBLEM IN YUGOSLAVIA

To ASHRAE:

A lecturer at the Agriculture Faculty in Zemum, Yugoslavia is working on the application of low temperatures in agriculture, particular attention being given to the properties of the insulating materials used, especially in connection with the determination of economic thickness of insulation material. Information is desired on how the economical thickness of insulation is determined taking into consideration the price of the insulation, installation cost, cost of the refrigeration and the operating time during the year. Currently many refrigerating plants are under construction in Yugoslavia but no attention has been given to the economic and technical points of view on the question of insulation.

P. B. L.

Amount of insulation required for any specific insulation problem is, of course, related directly to the design cooling capacity of the equipment installed. In other words, what amount of cooling must be available in the selected space provided by the installed refrigeration equipment. The heat gain (cooling load) due to the product involved, equipment operation, and general geographical design conditions, will determine the overall insulation requirement.

Such required insulation may be handled by a number of construction methods and types of insulating materials. The local cost per unit for material and construction will, in most instances, be the controlling factor relative to the choice of insulation material used. In some cases, there will be architectural limits due to space available for the building and such limits will also be controlling factors in the physical amount of insulating materials that may be used. Each problem in the application of insulation must be considered by itself. It would be difficult to give an overall factor or figure that would enable a statement with respect to the economic thickness of insulation. The authoritative reference for insulation characteristics is the Society GUIDE.

WHO'S WHO IN ASHRAE

Insofar as possible, these listings will each appear twice a year

ASHRAE OFFICERS, COMMITTEES
See page 72, this issue

REGION AND CHAPTER OFFICERS
See page 90, May JOURNAL

RESEARCH AND TECHNICAL COMMITTEES
See page 74, February JOURNAL

STANDARDS PROJECTS
See page 63, July JOURNAL

INTER SOCIETY COMMITTEES
See page 66, February JOURNAL

Proposed standards available

A. T. BOGGS, III
ASHRAE Technical Secretary

The amendment to Section 8.8.24 of the By-laws concerning the responsibilities of the Standards Committee and the procedure for developing and adopting standards became effective on June 13 during the Annual Meeting. The amendment states that following approval of a standard or revision to a standard by the Standards Committee, a notice will be published in the JOURNAL stating that such is available for comment. Copies will be sent upon request and comments addressed to the Standards Committee, care of ASHRAE Technical Secretary at the 234 Fifth Avenue, New York 1, N. Y., will be received for a period of 60 days following publication of the notice.

At this time **notice is hereby published** that the following standards have been approved by the Standards Committee and review copies are available for comment. Such comments should be submitted no later than October 1.

1. **20-41R** Method of Testing for Rating **Remote Mechanical Draft Air-Cooled and Evaporative Condensers**—It is the purpose of this Standard to specify procedures, apparatus, and instrumentation which will produce accurate capacity determinations for these refrigerant condensers.

2. **37P** Methods of Testing for Rating **Unitary Air Conditioning Equipment** — This standard provides test methods for determining the cooling capacity of unitary air conditioning equipment and applies to mechanical-compression unitary air conditioners or matched assemblies which operate non-frosting.

3. **47-35R** Methods of Testing and Rating **Return-Line Low-Vacuum Heating Pumps** — This standard provides a method of rating the air- and water-handling capacity of a return-line low-vacuum heating pump under defined standard conditions together with the power required to drive the pump under these conditions and also provides a standard test procedure by which a pump may be qualified or certified as meeting its rating.

ASA: The **Eleventh National Conference on Standards** will be held October 25-27 at the Sheraton-Atlantic Hotel, New York City. One topic to be considered will be the standards needs of the Department of Defense. This information will affect those companies engaged in the design and manufacture of defense equipment. Another phase of the conference will deal with significant standardization accomplishments and further needs for standards in the building industry. This session will be sponsored by the Modular Building Standards Association. A third session will explore various ways in which standardization helps management achieve its objectives of increased sales, production, and earnings.

Z9.2-1960: This American Standard on Fundamentals Governing the **Design and Operation of Local Exhaust Systems** was approved as an American Standard on June 23, 1960. Copies will be available from ASA in the near future.

Nema: A new list of available Nema standards publications was published June 20, 1960. The following standards will be of interest to ASHRAE members: **AD1-1960 Adsorption Equipment** — In addition to testing procedures, this standard describes a method of determining moisture vapor dew-point and includes a number of definitions applying to adsorption equipment. 40c per copy.

HU1-1960 — Industrial Heating Units and Devices — This standard has been revised as of June 1960 to include the latest information on dielectric strength. 30c per copy. These publications may be obtained from Nema headquarters, 155 East 44th Street, New York 17, N. Y.

NFPA: A number of standards developed by the National Fire Protection Association have been revised or made available during 1960. Of primary interest to ASHRAE are: (1) **90A — Air Conditioning and Ventilation Systems (other than residence type)**, (2) **90B—Residence Type — Warm Air Heating and Air Conditioning Systems**, (3) **251 — Fire Tests of Building Construction and Materials.** Copies are available from NFPA, 60 Batterymarch Street, Boston 10, Mass., at 50c each.

ASHRAE STANDARDS PRODUCTS

Currently contemplated ASHRAE Standards Projects, both as proposed revisions and new standards, were listed on page 63 of the JOURNAL for July 1960. Included were identification of committee chairmen and membership.

BULLETINS

(Continued from page 73)

Standard line consists of seven sizes for ⅛ through ¾-hp applications.
Kirsch Company, Sturgis, Mich.

Cooling Tower. Extending the capacity of the Double-Flow Aquatower line, Series 15 combines features of both Double-Flow and industrial cross-flow towers. Included are: sloping louver walls and broad louvers, glass reinforced polyester filling supports for permanent realignment and positioning of splash bars, open gravity water distribution system, low pumping head and min height in relation to capacity. New features of the tower are: combined mechanical equipment support and hot water lateral, flow control valves and external lube lines on gear drives. Details on the series are presented in four-page Bulletin DFA15-60.
Marley Company, 222 W. Gregory Blvd., Kansas City 14, Mo.

Magnetic Drives. In ratings from 75 to 4000 hp, drives added to this manufacturer's adjustable speed drive line feature simplified design and provide adjustable speed performance over an automatically regulated 20:1 range. Drive is based on a liquid-cooled magnetic coupling design that features stationary field construction, bearings that can be relubricated without disassembly and a specially designed cooling system that permits a planned flow of air through the drive at all times. Bulletin 3650.
Louis Allis Company, 427 E. Stewart St., Milwaukee 1, Wisc.

Urethane Foams. Materials, equipment and design assistance offered as a customer service are described in an eight-page bulletin dealing with production of urethane foams. Use of flexible and rigid foam-in-place resins for low temperature insulation, shock-proof packaging and encapsulation of electronic components are among applications covered. Bulletin shows facilities for running customers' molds under production-line conditions to evaluate products and tells how the company aids customers in adapting urethanes to their specific plant needs.
Isocyanate Products, Inc., Wilmington 99, Del.

Packaged Blowers. Described in four-page Specification Bulletin EN-6055 are both Model K1, with one blower, and Model K2, with two blowers. Units are designed to match the manufacturer's line of gas-fired duct furnaces. Performance data tables aid selection of drives and motor sizes to be used when handling air quantities of from 2000 to 6000 cfm with the K1 blower and from 4000 to 12,000 cfm with Model K2, against external static pressures of from 0.1 to 1.5 in. water column. Additional tables and diagrams give transition duct dimensions to be used with duct furnaces.
Reznor Manufacturing Company, Mercer, Pa.

Tool Steel Comparison Guide. Tool steels are listed in this 28-page bulletin according to AISI-SAE classifications, with an index reference listing them by trade name, classification and number.
Peninsular Steel Company, 24401 Groesbeck Hgwy., P. O. Box 3853, Detroit 5, Mich.

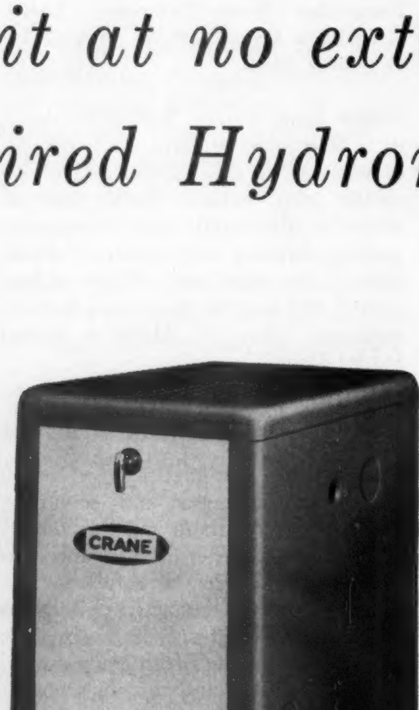
Solder Joint Valves. Listed in detail in a four-page bulletin are size and dimensions of gate, globe and check solder joint valves. Each type of valve is illustrated with a cutaway picture showing flow path of fluids through the valve body. A special feature of the bulletin is a set of instructions on "How to Make a Sound Solder Joint."
Walworth Company, 750 Third Ave., New York 17, N. Y.

Oscillograph. Designed as a reference guide for engineers and scientists, this 36-page bulletin on the direct-recording Visicorder oscillograph contains 18 case history descriptions. Detailed reports on current applications of the instrument for such purposes as provision of high frequency analog data in industry and missile recorder and diesel engine testing are included.
Minneapolis-Honeywell Regulator Company, Heiland Div., 5200 E. Evans Ave., Denver, Colo.

Adjustable Speed Drives. Describing operation and performance of Electronic Select-A-Spede Drives, four-page Bulletin 101 covers principle of the units, speed regulation and range. Drives range in size from ¾ to 4 hp and feature a dc motor powered from a wall-mounted electronic control panel. Adjustable voltage is applied to the motor armature from the panel, which converts ac line voltage to a regulated rectified dc source. Speed regulation to within 3% from no load to full load over an adjustable 8:1 speed range is provided. Control switches are included to compensate for line voltage variations up to ±10%.
Louis Allis Company, 427 E. Stewart St., Milwaukee 1, Wisc.

Proof of Quality

Add it at no extra cost with Crane Gas-fired Hydronic Systems

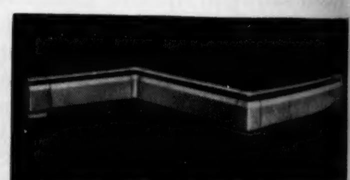


Residential Gas-fired Boilers

SUNNYDAY 5 Ribbon-type burner, with an A.G.A. input rating of 112,000 to 238,000 Btu per hour, for water and steam, with or without tankless heater. Package combinations start with a basic gas-fired boiler (Model C) through the assembled and wired package water boiler (Models GPTA and GPA). Flush or enclosing jacket.

SUNNYDAY 6 Features a raised drilled bead cast-iron burner, enclosing jacket. A.G.A. input rating is from 50,000 to 200,000 Btu per hour as a water boiler only. Crane Sunnyday 6 combinations range from basic boiler (Model C) through completely assembled and wired package boiler (Model CPA).

New Crane Sunnybase Panels



CRANE TYPES L AND H SUNNYBASE PANELS are new non-ferrous types in three different capacities. These I.B.R. rated units are easy to install (just four pieces to use) and accessories are snap-on design.

TYPE L is for use where maximum lineal coverage is needed. It has a capacity of 690 Btu per lineal foot with average water of 200 degrees.

TYPE H is for use where high capacity per lineal foot is needed because of limited wall area. Type H-75 has a capacity of 850 Btu per lineal foot. H-100 has a capacity of 910 Btu per lineal foot. Both ratings are with 200-degree water temperature.

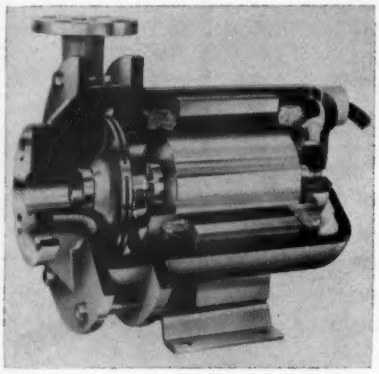
ALSO—TYPE C for residential use. Cast iron, with I.B.R. rating of 690 Btu per lineal foot.

SUNNYWALL TYPE N FINPIPE RADIATION for commercial, institutional and industrial use where maximum heat must come from limited space.

PARTS AND PRODUCTS

LEAK-PROOF PUMPS

Completely self-contained, these "canned" pumps for leak-proof handling of fluids are motor-pump com-



binations in which the material being handled circulates within the motor. Pump impeller is connected directly to the motor shaft, therefore no seals, packing or stuffing boxes are required. Motor rotor and field are encased in stainless steel "cans" Heliarc welded during fabrication to isolate them from the material being pumped. Pump is designed for all-angle installation and is therefore suited for use in close quarters. It is available in ½, ¾ and one-hp rating with capacities to 63 gpm.

Robbins & Myers, Inc., Springfield, Ohio.

DISPOSABLE FILTERS

Developed to operate at a low pressure drop while still providing high efficiency and dirt holding capacity, the deep-pleat design of these disposable filters provides large media area in a compact, pre-formed, folding filter cartridge. Three interchangeable cartridges in three atmospheric efficiency ranges comprise the HP series: range of HP-100 is 85%, HP-200 95% and HP-2 35%.

Folding media consist of a reinforced material of extremely fine glass fibers in the HP-100 and 200 series and reinforced, non-woven cotton fabric in HP-2.

Farr Company, P. O. Box 90187, Airport Station, Los Angeles 45, Calif.

FORCED-DRAFT BOILERS

Certified output ratings for this new line of forced-draft packaged commercial boilers are 83 to 691 hp for the low pressure units and 82 to 672 hp for high pressure units. Low pressure packages are constructed in accordance with the ASME code for 15 psi steam or 30 psi water and high pressure units for 125 or 250 psi steam. Higher pressures are available on special order.

Burners fire natural gas, all grades of fuel oil or combination gas/oil. Adjustable variable-vaned air nozzle permits shaping of the oil flame with the varying grades of fuel oil found in different areas. Highest heat release in any of the low pressure packaged units is 66,660 Btu/hr per cu ft and in high pressure units 64,620.

American Radiator & Standard Sanitary Corporation, Industrial Div, Detroit 32, Mich.

LOW SILHOUETTE UNIT

Only 14½ in. high, this air conditioner was designed for use in multi-story buildings featuring floor level fenestration or low windows. A fan coil unit, utilizing two small-diam pipes and a condensate drain, it is fed hot or chilled water from a central source. Pipes, condensate drain

and electrical service lines are all located above the floor. Unit installs free standing on the floor, a few in. from the wall. Four standard "Low-Boy" units are available with a range of 200 to 600 cfm and 14,300 to 44,900 Btu/hr.

Modine Manufacturing Company, 1500 DeKoven Ave., Racine, Wis.

PLASTICS VALVES

Latest addition to this company's line of plastics corrosion resistant fluid handling products are Polypropylene Throttlable Gate Valves. Light in weight, with high strength and chemical resistance, they are cited as possessing excellent resistance to most solvents, greases, oils and the majority of common acids at temperatures up to 185 F.

Valves are available from stock in sizes from ½ to two in. with socket weld, flanged or screwed ends and combine features of straight-through, no-pressure-drop flow with close throttling control.

Vanton Pump & Equipment Corporation, Hillside, N. J.

STANDBY POWER UNITS

For continued operation of such electrical equipment as lighting, ga

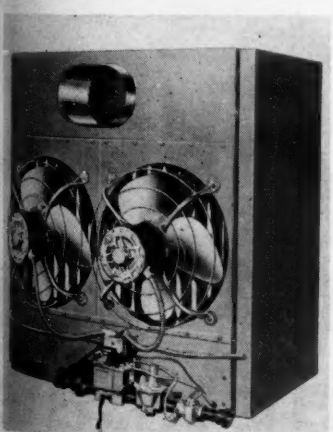
valves, incubators and telephones, these automatic emergency lighting and power units feature frequency interference suppression, instant starting, frequency stability and built-in power factor correction. Operation of the desired equipment is cited as being provided within 1/20th sec after power line failure. All models are equipped with heavy duty plug-in type inverter vibrators, having four-point voltage regulators which make possible proper output voltage for the power load being protected.
American Television and Radio Company, 300 E. 4th St., St. Paul 1, Minn.

ICE MERCHANDISERS

Two ice merchandising units, adapted for storage and sale of packaged ice, have been introduced by this manufacturer. Designated Models IM-24 and IM-38, they have capacities of 60 and 100 ten-lb packages, respectively. Maintaining temperature at approximately 25 F is a ¼-hp Tecumseh compressor.
Starrett Refrigeration Company, 4518 W. Ohio Ave., Tampa 3, Fla.

SUSPENDED UNIT HEATERS

Ranging in capacity from 175,000 to 300,000 Btu, this new line of suspended gas-fired unit heaters implements the manufacturer's present line, making it complete in both pro-



peller fan and blower models from 25,000 through 300,000 Btu. All heaters are available with either aluminum or stainless steel heat exchangers and feature cast iron burners.
Peerless Manufacturing Div, Dover Corporation, Louisville, Ky.

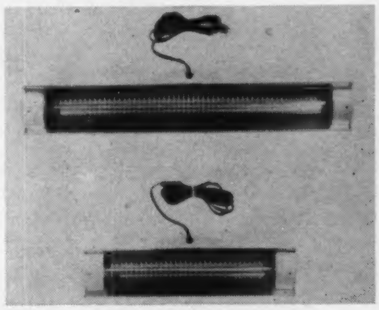
PORTABLE COOLER

Redesigned, this two-speed portable evaporative air cooler, Model CB-8P-2, has a large water reservoir holding four gal, allowing super-saturation of the pad area. Filling is done through an accessible top opening with hinged cover and water-level indicator.

Motor is static-free, 1/23 hp and operates on 115 volt, 60 cycle ac.
Thermador Electrical Manufacturing Company, 5119 District Blvd., Los Angeles 22, Calif.

PLUG-IN MODELS

Two plug-in wall-mounted infra-red radiant heaters, with capacities of 450



and 800 watt, have been introduced to service areas up to 30 and 50 sq ft, respectively. Tip-over switches prevent units from operating in any position except the intended wall-mounted way and automatically turn the current off if the unit should fall from the wall.
Hanovia Lamp Div, Engelhard Hanovia, Inc., 75 Austin St., Newark, N. J.

ICE STORAGE BINS

Three new ice storage bins, Series B-400-B, BH-1250 and SB-1500, for storing flaked and cubed ice, have capacities of 400, 1250 and 1500 lb, respectively. All bins are available in a choice of baked-on enamel or stainless steel exteriors, watertight stainless steel interiors, three-in. glass fiber insulation and multiple doors for easy ice removal.
Scotsman, Queen Products Div, King-Seeley Corporation, Albert Lea, Minn.

WALK-IN TEST ROOMS

Constructed in panel form and shipped knocked down to permit easy access through narrow doorways, these walk-in environmental rooms are quickly assembled. Two temperature ranges are offered: ambient to 140 and zero to 140 F. All models have fully enclosed heating elements and come in a number of stock sizes. Rooms measure 6 x 6, 6 x 8, 6 x 10 and 6 x 12 ft, with inside working height seven ft. Units have a 12 x 12-in. viewing window. Construction is of heavy gauge aluminum inside with corrugated aluminum floor plates.
Labline, Inc., 3070-82 W. Grand Ave., Chicago 22, Ill.

Applications

DUAL-PURPOSE COOLING SYSTEM FOR AIRPORT CONTROL TOWER

Air conditioning in the new 150-ft concrete control tower at Newark Airport serves a dual purpose. In addition to providing comfort cooling for personnel, it is designed to provide constant temperatures to insure accurate operation of delicate electronic radar and weather equipment. Limited space for equipment in the circular tower complicated design of the air conditioning system. Most of the occupied space is cantilevered out in a fan-shaped, reinforced concrete building, with continuous glass around most of the circumference.

Central primary air handling equipment, plus refrigeration and heating equipment, for the high velocity induction system is housed in the first floor of the tower, with chilled water provided by a 100-hp Trane Hermetic CenTraVac. A cooling tower, hidden by the structural design, is on the first floor roof. A concrete shaft, enclosing an elevator, stairway and air conditioning piping and high pressure duct work, extends 117 ft upward above the first floor roof. At the 65-ft level it supports three office and equipment floors. Piping is set within the supporting ribs projecting out to the perimeter of the office floors; within the office space, it follows the round contours of the walls.

Trane Induction UniTrane units, in continuous enclosures, are installed around the outside walls. A return air thermostat controls the three-way chilled water valves of every two induction units.

500-TON YEAR-ROUND SYSTEM CONDITIONS CANAL ZONE OFFICES

Design of an air conditioning system to service the central administrative offices of Panama Canal Company was complicated by problems of extreme heat and humidity in this equatorial climate. Yearly rainfall in the Zone amounts to an average 120 in., with almost all rain falling in the summer when dry bulb is approximately 92 F, close to saturation. Complicating the requirements were the existence of a large complex of electronic devices in the administration building and lack of a heating plant suitable for reheat purposes. Further, the area's heat, rain and humidity cause water or evaporative-cooled condensing systems to become choked with tropical growths of algae and other plant life, requiring frequent maintenance to keep a wet system in operation.

For the condensing side of the system, Kramer-Trenton Unicons were specified because of their wholly non-frrous construction. Abstracting 6,000,000 Btu/hr (500 ton) from the water chilling circuit, the refrigerating system is comprised of fou r 125-hp direct-drive Carrier compressors with unloaders and

two double-circuit direct expansion water chillers. Each compressor uses one Kramer-Trenton BD 202C Unicon for condensing. Electrical reheat is being used in the Governor's offices and in the communication rooms housing the electronic equipment. The rest of the space is maintained at 72 F dry bulb and 63 F wet bulb temperature without reheat, using water circulating cooling coils.

To assure adequate highside pressure during conditions of light loading, a Kramer Loop Winterstat Model LW60 was used. This unit was considered necessary to handle a combination of reduced outdoor temperature and unloaded compressor operation which would result in refrigerant liquid pressure too low to feed the chiller properly.

COMFORT COOLING FOR A CHURCH

Cruciform plan was the design basis for St. Bernard Catholic Church in Middleton, Wisc. Nave, seating 800, is a parabolic vault intersected by two smaller, similiarly shaped vaults. Total floor area is 22,150 sq ft. Glass areas of the building are substantial, occupying almost all the walls except the area above the altar. Cooling requirements are therefore large, and sufficiently varied to require zoning of heating and cooling equipment. Only space available for installation of this equipment was in the basement below the altar, so it had to be selected for max quietness.

Equipment used consists of a Trane Multi-Zone Climate Changer, 50-ton reciprocating compressor, evaporative condenser and centrifugal fan. Each unit is mounted on vibration isolators and on concrete bases isolated from the rest of the building. Refrigerant piping is supported from isolator spring-type hangers. Duct work from the Climate Changer to the six church zones was sized and insulated to reduce noise. Conditioned air is introduced to the nave through 32 x 5-in. grilles on eight-ft centers with blanked grilles fitted to present a continuous effect on both sides of the nave. Heating is provided by continuous runs of Trane Wall-Line Convectors, which are installed under the windows to prevent downdraft.

INSTALLATION FREEZES 45 TON OF TURKEY PER DAY

Ten Recold AS 3100 LT units and one evaporative condenser maintain the 46,000 sq ft freezing room of Land O'Lakes Creameries at Frazee, Minn., at a constant temperature of −25 F. Current production capacity of the installation is 45 ton of turkey per day.

28 UNITS SUPPLY HOTEL REFRIGERATION

Highly specialized refrigeration systems serve the recently completed 22-story Denver Hilton Hotel. Maintaining cold storage for everything from meats to tropical fruits are 23 separate walk-in refrigerators, with refrigeration for the building provided by 28 units, both high and low temperature, manufactured by Larkin Coils, Inc.

CLASSIFIED ADVERTISING

RATES—Classified advertisements at this heading are inserted in 8-point type at the rate of $1.00 per line or fraction thereof, including heading and address. Eight words to the line average. Box number address counts as one line. Minimum insertion charge, 5-line basis. Maximum insertion 10 lines. Prices are net, no discounts. Box number replies promptly forwarded without charge. Available Engineers insertions up to 60 words for Full and Associate members, and Affiliates are carried free.

NO DISPLAY advertising at this heading.

CLOSING DATE: Copy must reach publisher by 10th of month preceding date of issue.

NO PROOFS shown; no free checking copies. (Single copies 50c each with order.)

Address classified advertising or requests for further information to
ASHRAE JOURNAL
62 Worth St., New York 13, N. Y.

OPENINGS

MANUFACTURERS REPRESENTATIVES wanted. Choice territories open. Excellent opportunity to represent leading manufacturer of blower wheels, blower housings and fan blades for O.E.M. accounts. Desire replies from those now selling to manufacturers of air conditioning, heating and ventilating appliances and equipment. Reply to Sales Manager, Revcor, Inc., 247 E. Edwards St., Carpentersville, Ill.

EXPERIENCED DESIGN and PROJECT ENGINEERS for position with Midwestern Division of national manufacturer of air conditioning, refrigeration and heating equipment. Heat transfer experience required. Interesting work available in design and project co-ordination of commercial type package air conditioning and refrigeration products, and combination heating and cooling products in hydronics field. Excellent living conditions in adjacent Lake Michigan resort area. Send resume and salary requirements to Box 984, ASHRAE JOURNAL.

DESIGN ENGINEER—position open with small Consulting firm in New England. 3-5 yr experience in heating, ventilating, air conditioning, plumbing, or electrical design and layout necessary. Send resume to Box 987, ASHRAE JOURNAL.

AVAILABLE

AIR CONDITIONING and HEAT PUMP ENGINEER —22 yr experience. Window type and residential air conditioning package systems, heat pumps, systems design, unit coolers, heaters, finned coils. Thoroughly familiar with design, testing, production methods, tooling, purchase specifications. N.Y.P.E. license. Prefer Western New York State location. Box 869, ASHRAE JOURNAL.

AIR CONDITIONING ENGINEER—BSME, PE. Comprehensive experience in design, testing, manufacturing and sales of packaged air conditioning equipment. Thorough knowledge of automobile air conditioning design, testing and manufacturing. Also experienced in low and ultra low temperature equipment. Desire management position in any phase of manufacturing firm which is primarily concerned with air conditioning and refrigeration products. Box 985, ASHRAE JOURNAL.

DESIGN ENGINEER available—6 yr experience includes duct designing, air conditioning field. From Columbia, S. A., desires Draftsman position in New York City area. Resume on request. Box 986, ASHRAE JOURNAL.

MANAGING ENGINEER—commercial and industrial refrigeration and air conditioning. With superior product designs, manufacturing methods and application engineering, properly coordinated and geared to present day requirements, expansion can be rapid. Have necessary experience and qualifications, can direct all phases or alternately engineering and specialized manufacturing operations, as required in an organization, small but ready for sound expansion. Box 988, ASHRAE JOURNAL.